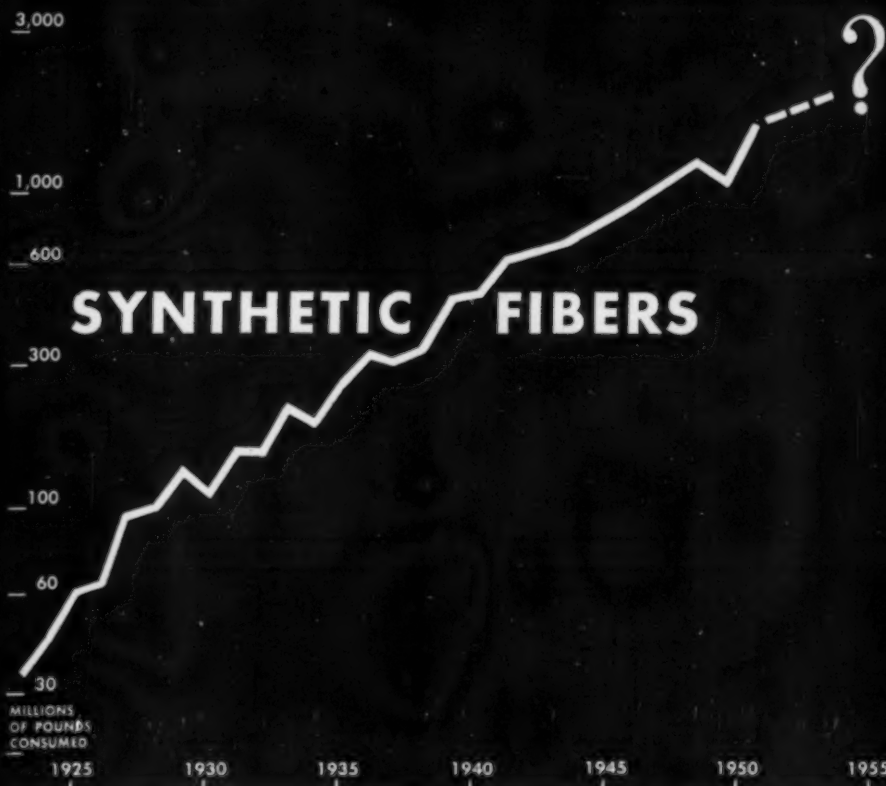


AUGUST
1951

Chemical Engineering



REPORT

ON THE PAST & FUTURE OF SYNTHETICS: PRODUCTION, USES, ADVANTAGES.

PAGE 125

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the trade marks "tt" and "TUBE-TURN" are applicable only to products of TUBE TURNS, INC.



In special alloy piping systems, alloy TUBE-TURN Welding Lap Joint Stub Ends permit use of lower-cost carbon-steel flanges as shown in cut-away view.

Special alloys lick special piping problems



Write Dept. H-8 for free booklet "Pipe and Fitting Materials" which gives specifications, properties and welding procedures for various materials.

YOU can overcome special problems of corrosion, fluid contamination, pressure, or temperature by selecting pipe and welding fittings of special materials.

Tube Turns, Inc. continually studies the proper application of different materials to piping systems. The complete line of TUBE-TURN Welding Fittings is available in more than forty different alloys. Today's piping engineer can choose from intermediate and high alloy steels containing chromium, nickel, or both; commercially pure nickel, copper, and aluminum; and alloys of these.

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"Be sure you see the double tt"

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AUGUST
1951

Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

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Vol. 58—No. 8

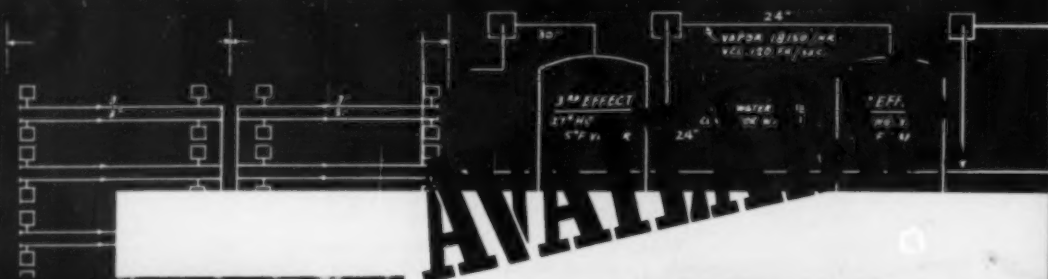
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AVAILABLE

SULFURIC ACID

Increasing scarcity of sulphuric acid makes conservation more and more important. A vast potential source is the waste pickle liquor from strip mills and other acid-consuming industries.

Corrosion-resistant Swenson Crystallizers, Filters, and Evaporators have been specially designed for reclamation service. They remove the iron salts from spent liquor and reconcentrate the acid to usable strength.

CRYSTALLIZERS like these are used to precipitate copperas from pickle liquor as crystals, which can easily be extracted by filtration. Rubber-lined steel construction is used to resist corrosion.

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Division of Whiting Corporation

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Harvey, Illinois

LEGEND

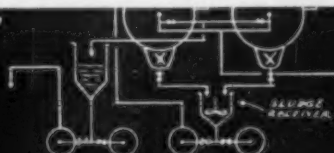
- VALVE NO.
- VALVE NO.
- VALVE NO.
- ↑ ATMOSPHERIC
- AGITATOR

- FORCE VALVE

- Y FURNACE OR HEAT EXCHANGER
- 6 1/2" ST. 6" STEEL PIPE
- 6 1/2" ST. 6" STEEL PIPE

CAUSTIC LIQUOR COLLECTED FROM OVERFLOWS ALL OVER THE PLANT

TO REMOVED
SLUDGE TO BE SKIPPED OUT OCCASIONALLY



2 NEW AO PRODUCTS

For Better Welding See-Ability!



COVER LENSES
and
COVER PLATES

NEW PLASTIC COVER LENSES

Give Longer Life . . . Reduce Fogging



Here's AO's latest in protecting filter lenses from spatter in welding and burning operations. Made of thin cellulose, center portion of lens is raised to permit a space between it and the filter lens — thus a fiber washer is not needed to separate the lenses. RESULT: THIS AIR SPACE BETWEEN LENSES CREATES A NEAR VACUUM THAT AUTOMATICALLY REDUCES FOGGING TO A MINIMUM.

The No. 162 LASTS LONGER, too — won't break when dropped — won't crack because shock-absorbing acetate cushions the blow.

QUICK FACTS

- Sparks bounce off without damage.
- Resists fusion of hot metals—deflects spatter.
- Remains pit-free longer than glass.
- Clear acetate allows clear vision.

NEW PLASTIC COVER PLATES

Give Thrifty Protection Against Pitting and Scratching

These clear, hard plates (AO No. 168) compare in smoothness and lustre with polished plate glass. Superior resistance to abrasion makes them ideal protection against pitting by welding spatter. Long lasting — easily cleaned.

YOUR NEAREST AO SAFETY PRODUCTS REPRESENTATIVE CAN SUPPLY YOU.

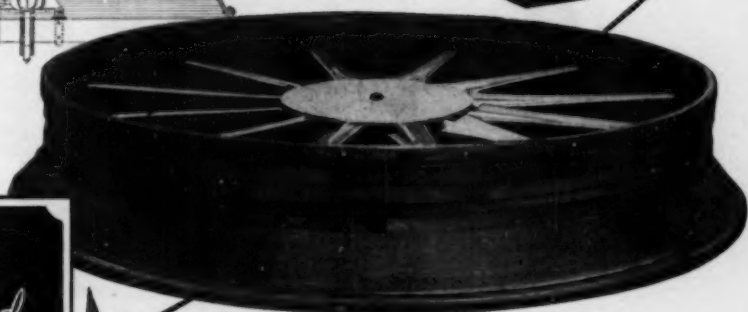
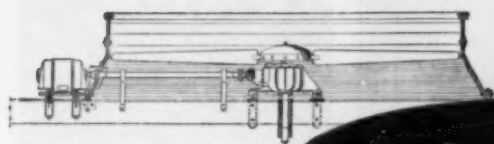
QUICK FACTS

- Optically correct.
- Clear — won't discolor under ordinary welding conditions.
- Protects against eye fatigue — boosts production.
- Won't peel, blister or shrink in service.
- Highly resistant to breakage.

American Optical
SAFETY PRODUCTS DIVISION

SOUTHBRIDGE, MASSACHUSETTS • BRANCHES IN PRINCIPAL CITIES

It's new...
so it's **MARLEY!**



Cooling Tower Fan Cylinders -

that are entirely new, distinctive in design . . . are another major addition to Marley's long list of achievements in cooling tower advancement.

Laminated Fan Cylinders are the sturdiest ever applied to cooling towers. Built entirely of overlapping layers of redwood boards, they are structurally strong . . . uniformly strong at every point. No metal shape rings or clamp strips are needed; there is nothing to corrode, loosen or vibrate. Laminated Fan Cylinders are built of the same material as the towers they serve . . . built to last as long.

MODERNIZE ANY LARGE INDUCED DRAFT TOWER

Laminated Fan Cylinders will reduce maintenance time and upkeep expense on any large cooling tower. No painting, no replacing rusted metal parts — you check fan cylinders off the maintenance list when you install modern Laminated Fan Cylinders. Engineers have ordered many of these fan cylinders for replacement since Marley recently made them available.

also producers of
DOUBLE-FLOW TOWERS
CONVENTIONAL TOWERS
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NATURAL DRAFT TOWERS
SPRAY NOZZLES

For detailed information, call your Marley representative or write for LP-30a.

The Marley Company, Inc.
KANSAS CITY 15, KANSAS

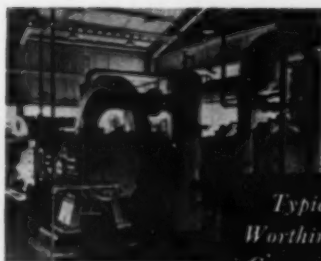




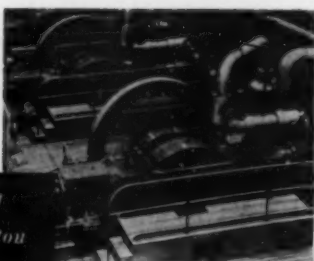
If it's a gas that can be handled ...WORTHINGTON COMPRESSORS *Handle it Better!*

Keeping pace with the chemical industries' rapid progress, Worthington builds compressors for the widest range of gases. More than that, Worthington maintains a staff of specialists whose sole job is to know — or to find out — the answers to all problems concerning gas compression.

That is why your own applications in this field can be best served by Worthington... with compressors that will perform more efficiently and economically over a longer service life. Why not get the whole story that proves *there's more worth in Worthington?* Write, describing your requirements, to Worthington Pump and Machinery Corporation, Compressor Division, Buffalo, N. Y.

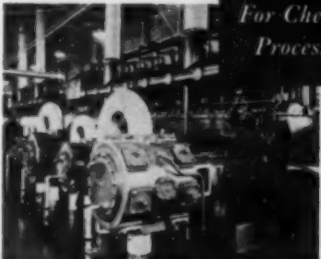


Steam Driven Compressors in a Synthetic Glycerine Plant.

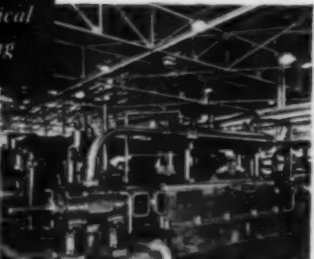


Steam Driven High Pressure Circulators in a Nitrogen Fixation Plant.

*Typical
Worthington
Compressor-
Installations
For Chemical
Processing*



Angle Gas Engine Driven Compressors in a Gas Oxidation Plant.



Motor Driven Multi-Stage Compressors, used in Liquefaction of Air.

Partial List Of Gases Handled By Worthington Compressors

Butane • Propane • Butadiene • Carbon Monoxide • Carbon Dioxide • Acetone Benzole Mixture
Sulphur Hexafluoride • Coke Oven Gas • Ethylene • Ethylene Dichloride • Furfural • Hydrogen
Hydrogen Chloride • Hydrogen Sulphide • Methyl Chloride • Methyl Ethyl Ketone • Nitrous Oxide
Oxygen • Sulphur Dioxide • Vinyl Chloride • Ethylene Oxide

WORTHINGTON



**NO OTHER
COMPRESSOR
WILL
OUTPERFORM
A
WORTHINGTON**

V-types



Balanced Angle
Compressors



Horizontal



Portable



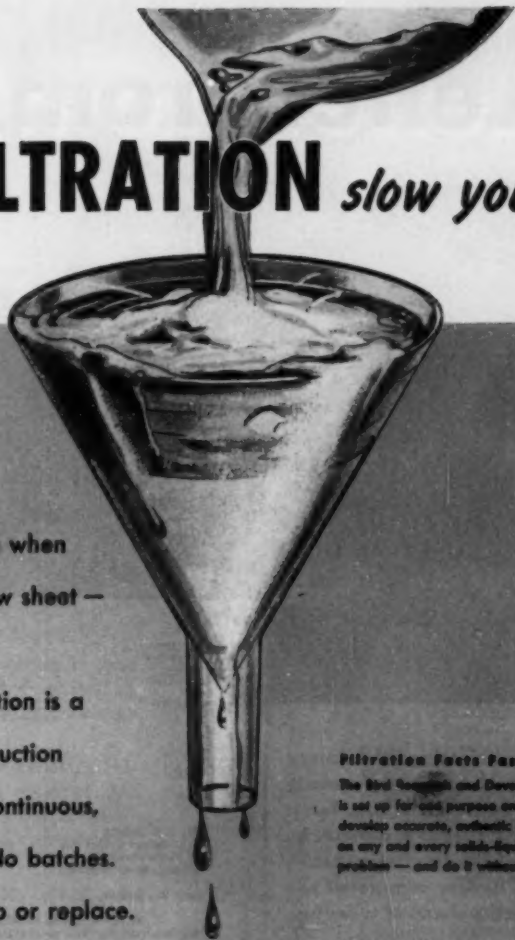
Radial



Gas Engine Compressors



Don't let **FILTRATION** *slow you down*

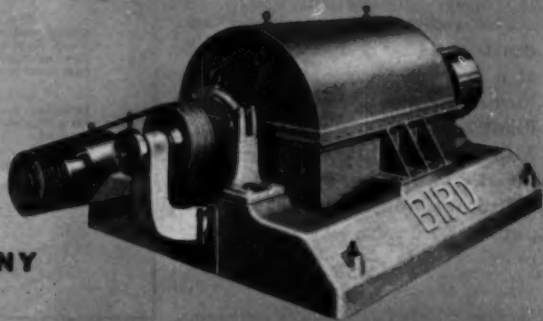


Maybe there was a time when
filtering dammed the flow sheet —
but not any more!

Bird Centrifugal Filtration is a
high capacity, high production
process—clean, quick, continuous,
automatic, economical. No batches.
No filter cloths to clog up or replace.
No vacuum. No auxiliaries.

Filtration Facts Fast—

The Bird Research and Development Center
is set up for one purpose only — to
develop accurate, authentic information
on any and every solids-liquids separation
problem — and do it without delay.



BIRD MACHINE COMPANY
South Walpole, Massachusetts

THE BIRD

**CONTINUOUS
CENTRIFUGAL**

FILTER

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The refinery was designed and constructed by Badger and consists of a Propane Deasphalting Unit, a Furfural Plant, an MEK Dewaxing Plant and a Clay Contacting Unit. A full range of lubricating oils and finished waxes are manufactured with a maximum annual lube output of 32,000 tons.

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December 27, 1950

Mr. I.V. Rehill
E.D. Badger & Sons Co.
75 Pitts Street
Boston, Massachusetts

Dear Mr. McMill,

We are bringing to an end the tests on the furfural plant and during the next few days we shall start operations.

From my office I can see the smoke of the stacks of the two heaters which are now drying out; it seems impossible to me that such a result could be obtained in this very short time. If I well remember, the first discussions on plant proportioning and our first meeting in Boston took place in August 1949.

On the occasion of the starting of the first lubricant plant I wish to express you my sincerest congratulations for your wonderful way in organizing this work; you must be really satisfied with the successful result obtained.

Yours sincerely,

Handwritten signature

T.L. de Pastovich
Technical Director

A SUBSIDIARY OF STONE & WEBSTER, INC.

NEW YORK

LONDON E. H. Rodger & Sons, Great Britain Ltd.

Process Engineers and Constructors for the Petroleum, Chemical and Petro-Chemical Industries

How BULK-FLO brings new economies for feeding—conveying—elevating of bulk materials

Check these 5 ways you benefit from LINK-BELT'S advanced engineering

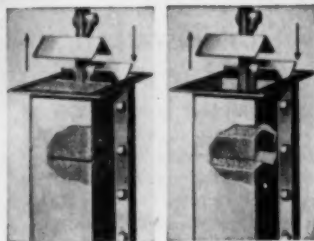
- 1. Positive movement** of material, with no avalanching on vertical or steeply inclined runs, because *solid flights* substantially cover area of BULK-FLO casing.
- 2. Gentler handling.** Material is protected in individual "compartments," resulting in minimum degradation.
- 3. Self-cleaning,** regardless of amount of material being fed. BULK-FLO lends itself to handling batches of material.
- 4. Constant speed.** Variable speeds are not necessary, because capacity can be varied by regulating feed.
- 5. Horizontal, inclined, vertical,** or combinations of these paths, in a single unit—often requiring less units, in less space at lower cost. Multiple feed and discharge points are practicable.

Best of all, when Link-Belt recommends BULK-FLO to your engineers or designing contractor, you know it's the *right* conveyor for your needs. For Link-Belt makes a *complete line* of feeding, conveying and elevating machinery.

Book 2175 has complete information on hundreds of materials that BULK-FLO handles profitably. Write for your copy . . . today.

LINK-BELT COMPANY: Chicago 8, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities. 12,180-A

LINK-BELT
BULK-FLO
FEEDERS • CONVEYORS • ELEVATORS



Full or partially loaded, Link-Belt BULK-FLO with solid flights provides positive, gentle material handling.

Bulk material handling is easier and safer with **BULK-FLO**

- Unit is self-clearing through intermediate runs to prevent contamination of batches of material and to permit use of conveyor for alternately handling different materials.
- Dust-tight construction.
- Handles batches on cycle operations.
- No contamination from lubrication.
- Chain and casings can be galvanized or made of alloy metals, depending on chemicals being handled.
- Can be made spark-proof. Slow operating speed reduces possibility of sparking.
- Suitable for hazardous areas. Liquid and vapor-tight, to handle volatile materials. Drives can be furnished with explosion-proof motors.

This L-path arrangement of the BULK-FLO Conveyor is particularly adaptable for multiple feed points.

Cut Cooling Costs

These 3 Ways

1. CUTS INSTALLATION COSTS

The air-quenching grate cooler comes as a complete unit, fits into existing plants readily because it operates horizontally. Installation costs are 10 to 30 percent less than the cost of installing any other type of cooler! Kiln piers need not be elevated . . . no pit is required beneath kiln.

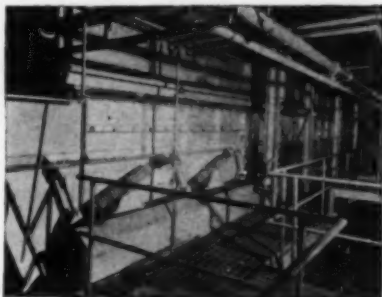
2. CUTS MAINTENANCE COSTS

Reciprocating motion of grate is carried on flexible rubber bushings and springs. No wearing parts and no slippage. Material does not slide on grate, it hops, gently and steadily. Lubrication is negligible, only four grease fittings on entire cooler. Maintenance cost runs as low as $\frac{1}{10}$ cent per barrel.

3. CUTS ROTARY KILN FUEL COSTS

Air-Quenching grate cooler actually returns 75% of sensible heat in material back to kiln as secondary combustion air. Material is cooled quickly, to a temperature where handling is no problem, by means of cooling air coming up through the relatively thin bed of hot material on grate.

4½ by 70 ft Allis-Chalmers air-quenching grate cooler installed in processing plant where it cools large quantities of material from 2500° F to approximately 150° F.



Handles Fine or Coarse Materials

Both fine and coarse materials can be cooled equally well. Need for a supplementary conveyor under cooler is eliminated. Pan conveyor can be added on cooler without need for an additional drive. Get more facts from the Allis-Chalmers representative in your area, or write for Bulletin 07B6368A, Allis-Chalmers, Milwaukee 1, Wisconsin.

Pulverator is an Allis-Chalmers trademark.

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Principal Cities in
the U. S. A. Distributors
Throughout the World.



Pulverators



Vibrating Screens



Jaw Crushers



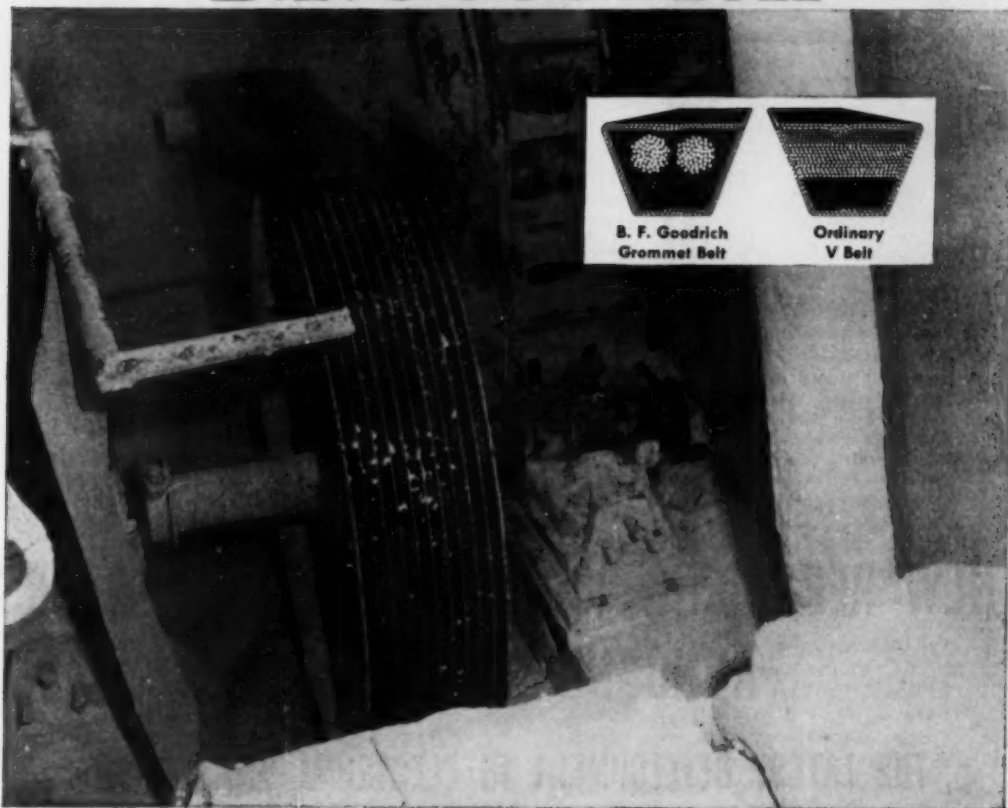
Grinding Mills



Gyratory Crushers



Kilns, Coolers, Dryers



Where a change to B. F. Goodrich grommet belts saved \$100 a week

B. F. Goodrich grommet V belts cut costs 20 to 50%

WHAT would you do if you were spending \$100 a week to replace failing V belts on one drive? That was the case in this mill—ordinary V belts failed in a week or less. They couldn't carry the terrific power load.

The company called in the BFG sales engineer and B. F. Goodrich grommet V belts were installed. That was 5 months ago and the grommet belts look as good today as the day they were installed. Here's why:

Endless—A grommet is endless, made by winding heavy cord on itself to form an endless loop. It has no overlapping cord sections. Because most of the failures in ordinary V belts

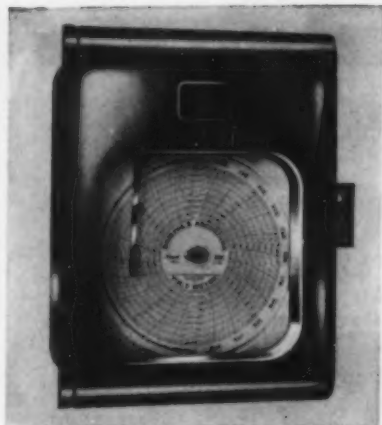
occur in the region where cords overlap, the endless grommet belt eliminates such failures.

Concentrated cord strength—All of the cord material in a B. F. Goodrich grommet belt is concentrated in twin grommets, positioned close to the driving faces of the pulley. No layers of cords to rub against one another and generate heat; cord and adhesion failures are reduced.

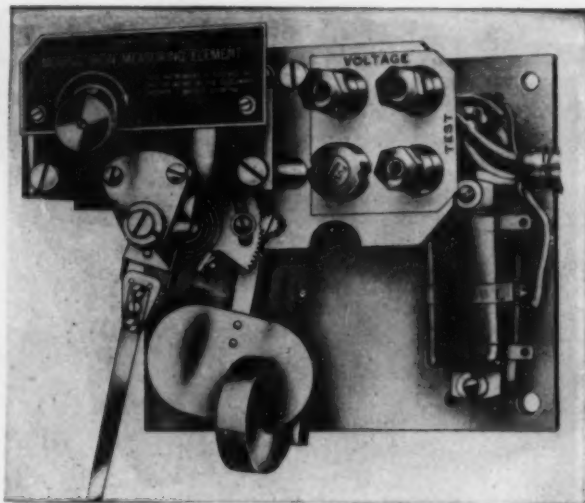
Better grip, less slip—Because a grommet is endless, a grommet belt is more flexible, grips the pulleys better. Size for size, grommet belts will give $\frac{1}{3}$ more gripping power, pull heavier loads with a higher safety factor.

Only B. F. Goodrich has the grommet!—No other multiple-V belt is a grommet belt (U. S. Patent No. 2,233,294). Now available in C, D and E sections. See your local B. F. Goodrich distributor. Ask him to show you his "X-ray" belt that illustrates grommet construction clearly. The B. F. Goodrich Company, Industrial and General Products Division, Akron, Ohio.

Grommet Belts BY
B.F. Goodrich
RUBBER FOR INDUSTRY



PERMANENT MOUNTING offered in three models: interchangeable surface and flush, surface-panel and flush panel. Note the pleasing, well-balanced appearance. Also: **PORTABLE INSTRUMENTS** are offered in two models: for setting on floor or table; for mounting on walls or poles and general service.



NEW MOVING-IRON MEASURING MECHANISM. High torque, low burden, rugged construction for assurance that the original calibration will be retained through years of service. Shock-absorbing stainless steel bearings.

NEW RECORDING VOLTMETERS AND AMMETERS ANNOUNCED BY BRISTOL

THE LATEST DEVELOPMENT IN ELECTRICAL MEASUREMENT

**Outstanding for—High actuating torque... Low electrical burden...
Stability of calibration... Dependable accuracy**

Here is electrical measurement at its finest . . . most dependable . . . most convenient to use—the product of nearly 60 years of experience in building recording voltmeters and ammeters for almost every application.

The new moving-iron measuring mechanism is a type

known for high actuating torque and low electrical burden . . . refined by Bristol engineers for greater accuracy and ruggedness.

Other Bristol developments that assure convenience in use include the new Series 500 dust- and moisture-protected die-cast aluminum case, quick-set chart hub for easy chart changing, non-obscuring pen lifter, snap-on chart plate.

To keep up with the latest in recording instruments, send for Bulletin E1111, addressing THE BRISTOL COMPANY, 109 Bristol Road, Waterbury 20, Conn.



BRISTOL

AUTOMATIC CONTROLLING, RECORDING AND TELEMETERING INSTRUMENTS

*Air-and-Moisture-sensitive
products should be
processed under Vacuum*

Vacuum Processing eliminates moisture, works at lower temperatures, saves labor, lengthens life, makes finished products highly resistant—often impervious—to air, moisture, and the effects of prolonged humidity.

Products can be totally or controllably dried, impregnated, distilled, evaporated and metallized under vacuum in less time at less cost for labor than by other processes . . . and at temperatures which do not impair chemical or physical properties.

Among the larger groups of products so treated are electrical parts . . . laminated paper sheets, condensers, coils, capacitors, armatures . . . to give permanent high level dielectric characteristics not economically attained by any other method.

Picture shows compact Stokes Vacuum Impregnator in which hundreds of small electric parts are treated at a single operation. One man can handle production on a dozen such units on a staggered cycle, treating thousands of parts per day.

Stokes is the only manufacturer of complete vacuum systems and Stokes engineers are experienced counsellors . . . ready to work with you on any application of Vacuum Engineering.

STOKES

STOKES MAKES

Plastic Molding Presses,
Industrial Tablating
and Powder Metal Presses,
Pharmaceutical Equipment,
Vacuum Processing Equipment,
High Vacuum Pumps and Gages,
Special Machinery

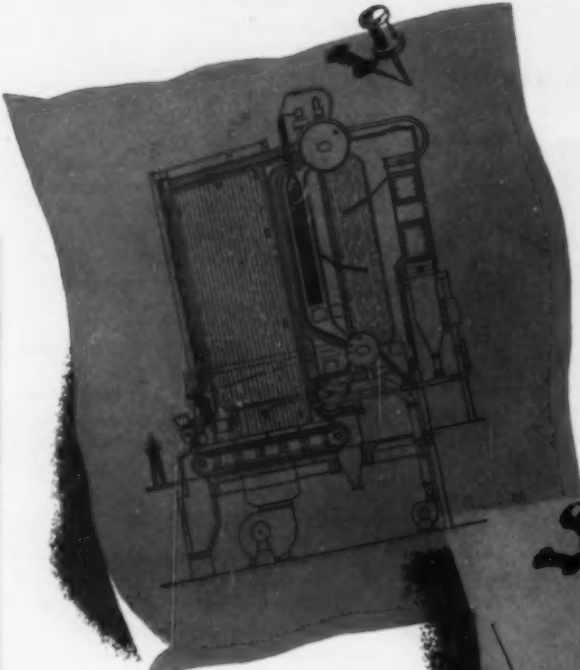
F. J. STOKES MACHINE COMPANY, 2225 EAGLE ROAD, PHILADELPHIA 19, PA.

They keep coming

Companies that have bought VU Boilers continue to buy them. In fact, a substantial proportion of all VU Units, in service and on order, have been purchased by organizations whose selection reflects their own first-hand experience. For example —


A STEEL COMPANY now has a total of eleven VU Boilers in four different plants. Starting with three units in 1936, it has reordered three times... most recently in the fall of last year with an order for three more units.

A TEXTILE MANUFACTURER ordered two VU Units in 1936. Another unit was installed in 1940 and a third in 1944. Still another



↑ VU-50 Unit fired with C.E. Spreader Stoker (continuous discharge type). The capacity of unit shown is 80,000 lb steam per hr; operating pressure 425 psi; steam temperature 650 F.

→ VU-50 Unit fired with pulverized coal. The capacity of unit shown is 200,000 lb of steam per hr; operating pressure 560 psi; steam temperature 760 F (VU units are in service for capacities up to 350,000 lb of steam per hr).



COMBUSTION ENGINEERING

ALL TYPES OF BOILERS, FURNACES, PULVERIZED FUEL SYSTEMS AND STOKERS; ALSO SUPERHEATERS, ECONOMIZERS AND AIR HEATERS

back for more!

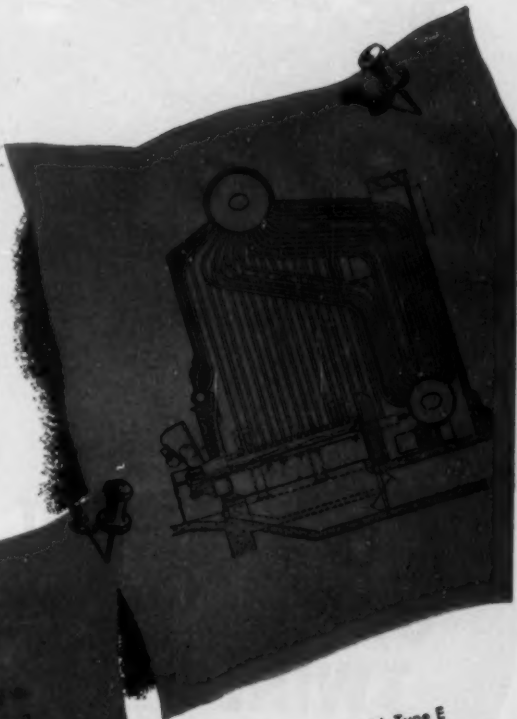
textile company installed one unit in 1945, a second in 1949 and has just ordered another.

A REFINING COMPANY ordered one VU Unit in 1937, another in 1940 and another in 1949 for one of its plants; also two in 1942 and one in 1947 for another plant.

A SEWAGE TREATMENT PLANT in one of America's large cities is another consistent buyer of VU Boilers. Its initial order in 1936 was for two units. Since then it has reordered three times, and now has a total of seven VU Boilers in service.

The story is the same wherever you go—in all sections of the country American industry is ordering and *reordering* VU Units. Why? Because the VU's advanced design, sound construction and consistent reliability have become a service-proved answer to lower steam costs. Once you have a VU Unit in service you soon *know* why so many large steam users *keep coming back for more.*

B-481



➤ VU-10 Unit fired with Type E Stoker. VU-10 Boilers range in capacity from 10,000 to 60,000 lb steam per hr. They may be fired by spreader, underfeed or traveling grate stokers, or by oil or gas.

➤ VU-50 Unit fired with oil or gas. The capacity of unit shown is 175,000 lb of steam per hr; operating pressure 400 psi; no superheat.

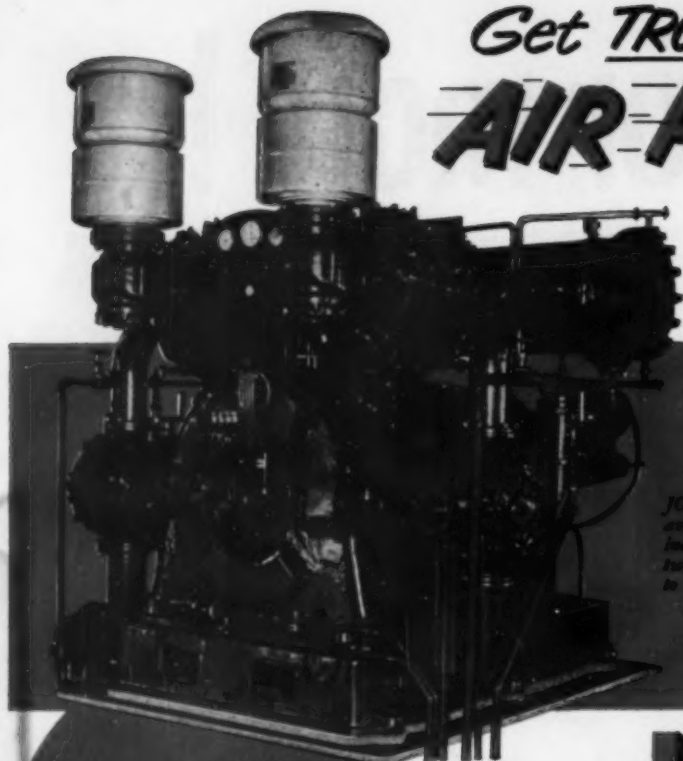
— SUPERHEATER, INC.

200 MADISON AVENUE, NEW YORK 16, N. Y.



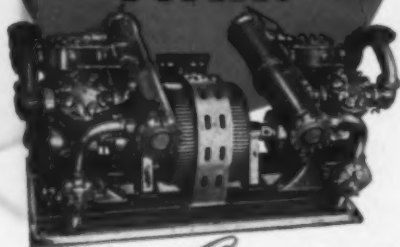
Get TROUBLE-FREE AIR POWER

at
**ROCK-BOTTOM
COST!**



JOY Series 100 compressors are available in two and four cylinder models and in single and twin units. Capacities from 370 to 3656 c.f.m.

**UP TO 3656
C. F. M. in a
TWIN!**



with a **JOY** PACKAGE TYPE **HEAVY DUTY WN-114 COMPRESSOR**

Install it, start it,—then forget it! That's what you can do with a JOY compressed-air power unit, because it's built to give constant, dependable service 24 hours a day, year in and year out. JOY Series 100 Air Compressors are two-stage, double-acting, heavy duty, continuous service compressors—much smaller than old style compressors of the same capacity, yet with operating economies exceeding those of the older, bulkier units. JOY pioneered the compact, modern, "package-type" compressor.

All wearing parts are replaceable on the Series 100—the finest air compressors you can put on the job. • Let us give you full details on the size that fits your air-power requirements.

*Consult a Joy
Engineer*

100 Years of Engineering Leadership

WBD 1 3915

JOY MANUFACTURING COMPANY

GENERAL OFFICES: HENRY W. OLIVER BUILDING • PITTSBURGH 22, PA.

IN CANADA: JOY MANUFACTURING COMPANY (CANADA) LIMITED, GALT, ONTARIO

NEW TRANE BRAZED ALUMINUM SURFACE

MORE HEAT TRANSFER EFFICIENCY

in

$\frac{1}{4}$

the space

with

$\frac{1}{3}$

the weight

at

$\frac{1}{2}$

the cost

A Smaller Unit Can Do A Bigger Job

More heat transfer from every cubic foot of space, more Btu's from every pound of surface, more Btu's per dollar—with the new Trane Brazed Aluminum Heat Transfer Surface.

Many of these Brazed Aluminum Units can pack 450 square feet of heat transfer surface—working surface—into one cubic foot. That's up to nine times more surface than a shell-and-tube unit with $\frac{3}{4}$ " tube can put into the same space.

In a given space, the units can meet practically any specifications of heat transfer, pressure drop, volume, number and direction of passes, and fluid velocity.

All aluminum, the units are much lighter than shell-and-tube heat exchangers—often needing only $\frac{1}{4}$ the weight to do the same job.

The units handle as many as five liquid or gas

streams at once. Headers can be designed for any job.

Trane Brazed Aluminum Surface, evenly brazed in an exclusive flux bath process, is as rugged as it is flexible—it takes test pressures up to 1,000 lbs. per square inch, temperatures from -300°F . to 500°F .

Because they pack so much heat exchange surface into every cubic foot, and because of advanced manufacturing techniques, the units are much less costly than conventional equipment—a smaller unit can do a bigger job. Trane Brazed Aluminum Units can often do the same heat transfer job as tubular exchangers that cost two or three times more.

If you have a heat transfer job—one that demands a large number of units—Trane Brazed Aluminum Surface may be the answer. Contact your nearest Trane sales office, or write direct.



Large units—left, or small—at right, flexible Trane Brazed Aluminum Surface provides heat transfer efficiency.

THE TRANE COMPANY, LA CROSSE, WISCONSIN
Eastern Mfg. Division . . . Scranton, Pennsylvania
Trane Company of Canada, Ltd. . . . Toronto
OFFICES IN 80 U. S. AND 14 CANADIAN CITIES

TRANE

MANUFACTURING ENGINEERS OF HEATING, VENTILATING AND AIR CONDITIONING EQUIPMENT

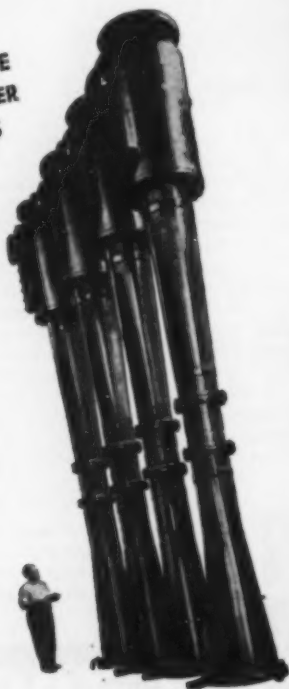
ELLIOTT Steam Jet EJECTORS

Now

SMALL
SINGLE-STAGE



MULTI-STAGE
and BOOSTER
EJECTORS



STANDARD
SINGLE STAGE



CORROSION-
RESISTING



Redesigned for New Flexibility

IN VACUUM APPLICATION

Without taking liberties with those design factors affecting good performance, the entire line of Elliott steam jet air ejectors has been checked over in the interests of standardization and easier application. Wherever a detail could be modified with advantage, it has been done. In the case of very large booster ejectors, a fabricated steel type has been added to cut down weight.

The result of all this is easier, simpler

application with greater flexibility, and more precise adaptation to specific conditions.

HAVE YOU A VACUUM PROBLEM?

Ask us — Elliott engineers, trail-blazers in process vacuum, have unparalleled experience in applying ejectors. They know what will work, how well it will work, what its operating cost will be, how to apply it. Use this experience, without obligation. Write us.

NEW BULLETINS READY

For up-to-the-minute specifications on any or all of the ejector types illustrated on the opposite page, ask us for the appropriate bulletins.

TWO-STAGE
UNITS

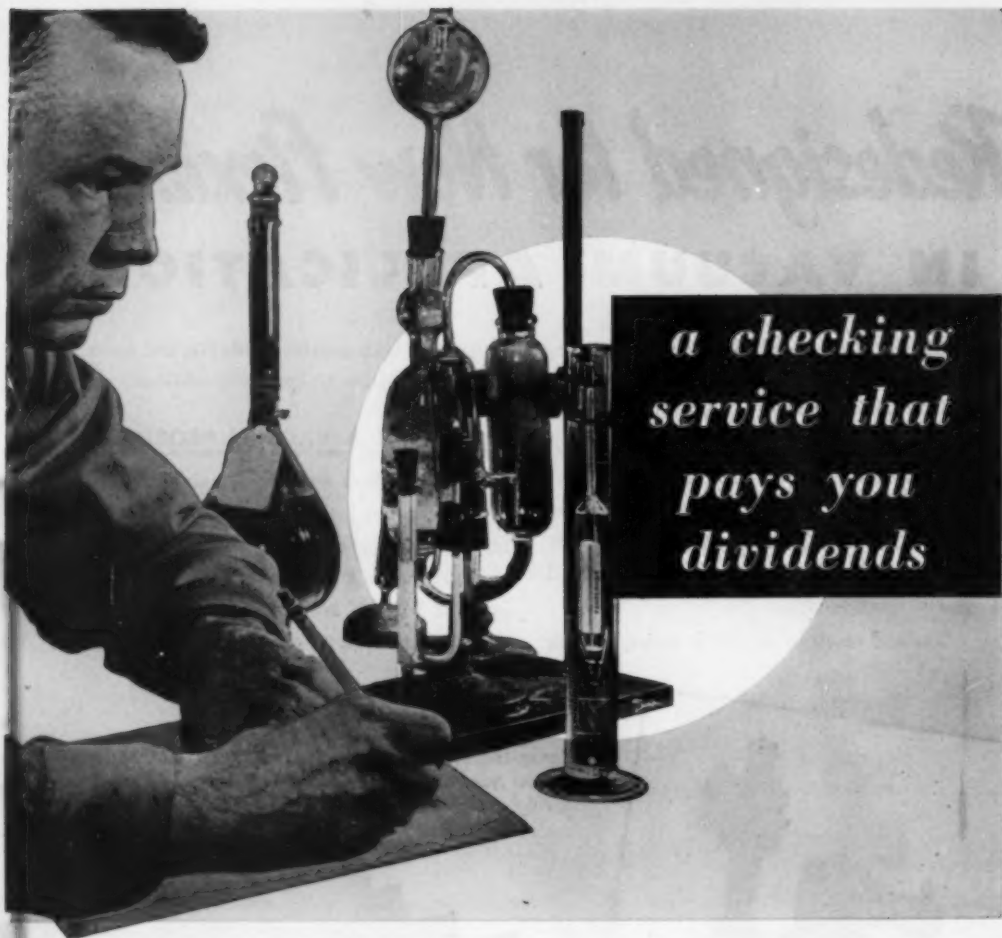


ELLIOTT COMPANY

Industrial Process Division • Jeanette, Pa.

PLANTS AT: JEANNETTE, PA. • RIDGWAY, PA.
AMPERE, N. J. • SPRINGFIELD, O. • NEWARK, N. J.

District Offices in Principal Cities



*a checking
service that
pays you
dividends*

Continuous laboratory control during the manufacture of Roosevelt's aliphatic naphtha solvents pays you dividends in *better products . . . in satisfied customers*. Why? Because this important part of the complete Roosevelt refining process guarantees that the naphthas you buy will always meet your specifications. Roosevelt gives you another important dividend, too! It is *complete* catalytic, sulphur removal. That means chemically stable solvents, free of offensive odors. Submit your solvent specifications to Roosevelt, today!

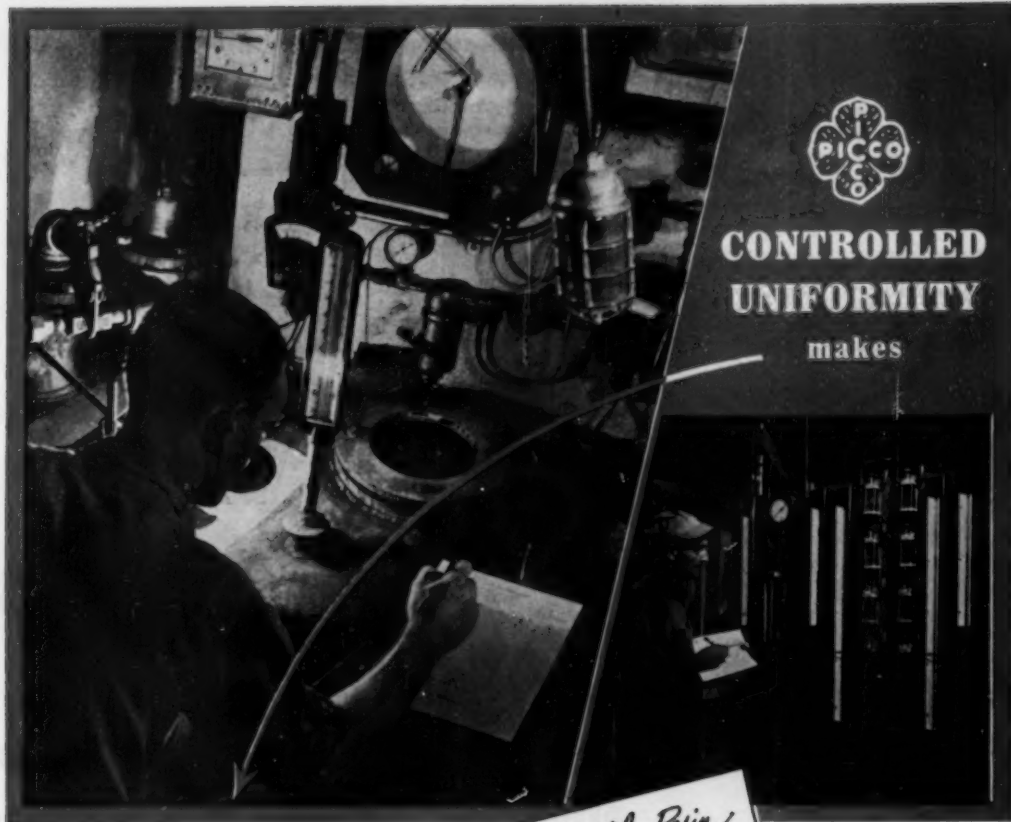


Write for your copy of
Roosevelt's book of specifications.



ROOSEVELT
oil and refining corp.

MT. PLEASANT, MISSOURI



**CONTROLLED
UNIFORMITY**

makes

PICCOLYTE

The Versatile Resin

dependable

You are assured of dependable uniformity when you use PICCOLYTE, because of the rigid control of every step of manufacture. The photograph above shows the controls of the Polymerizer, the kettle in which resin is made from Pinene.

Manufacturing equipment is of the most modern design, and highly perfected instrumentation procedure permits operators to keep the material under constant observation during processing.

PICCOLYTE is a versatile resin, having properties that make it ideally suited for a wide variety of products.

Write for bulletin giving complete details.

PENNSYLVANIA INDUSTRIAL CHEMICAL CORP.

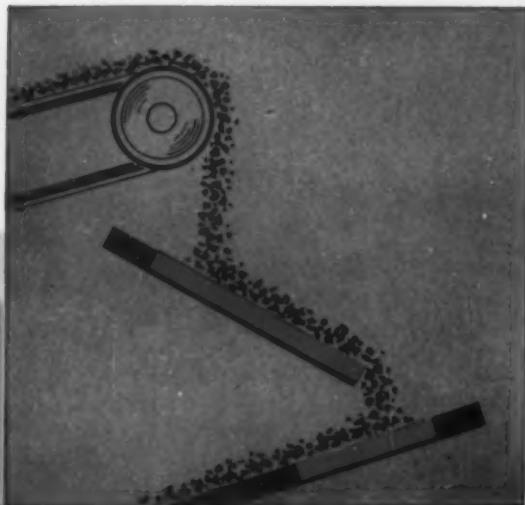
Chilton, Pennsylvania

*Plants at Chilton, Pa., West
Middletown, Pa., and Chester, Pa.*

Distributed by Pennsylvania Folk Chemical Co., Pittsburgh 30, Pa.

and Harwick Standard Chemical Co., Akron 5, Ohio

abrasion?



The weak link in keeping certain equipment on the production line often lies in rapid abrasion and erosion of vulnerable areas. For example:

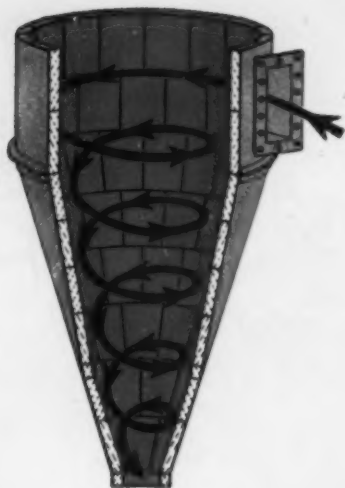
In Cyclone Dust Collectors where there's a ceaseless blast of highly abrasive particles.

In Coke Chutes and Hoppers which must withstand constant cascades of fiery coke or cold coke.

In Hot Blast Mains through which dust-laden gases travel at high velocities.

In Billet Heating Furnaces through which hundreds of massive metal slabs are pushed.

Under conditions like these, metals, paving bricks and other normally durable materials are simply worn away — and in very short order. It takes exceptionally tough linings or



erosion?

Here are even tougher

bearing surfaces — as provided by our MONOFRAK K fused cast blocks or our CARBOFRAX silicon carbide bricks and shapes — to stand the gaff.

Both these Super Refractory materials by CARBORUNDUM are within one index point of diamond hardness! It is this hardness that gives these Super Refractories their exceptional resistance to abrasion — from room temperature to high heats.

Granted, abrasion is seldom an isolated condition. It's usually abrasion *plus* . . . heat, or acid attack, or some other condition. But, as you can see (top, opposite page), these Super Refractories have many other properties, equally as desirable as abrasion resistance and equally important in certain applications.

Information is now available on all the various groups of Super Refractories by CARBORUNDUM. Just send the coupon and you'll receive our new booklet. No obligation, of course.



THE CARBORUNDUM COMPANY

Refractories Division

Perth Amboy, New Jersey

"Carborundum," "Carbofrax," "Monofrak" and "Alfrax" are registered trademarks which indicate manufacture by The Carborundum Company.

SUPER REFRACTORIES ARE ALSO USED

WHERE HEAT CONDUCTIVITY IS NEEDED. At elevated temperatures CARBOFRAX refractories conduct heat as rapidly as chrome-nickel steels! This characteristic is invaluable in checkers, muffles, hearths, etc.

WHERE CHEMICAL ACTION IS PRESENT. In general, all Super Refractories are either neutral or acid in nature — are widely used where chemical inertness is important.

WHERE STRENGTH IS IMPORTANT. No commercial tonnage refractories have greater strength than Super Refractories. All can withstand over 300 psi at 2750° F without crushing.

WHERE HIGH HEAT IS INVOLVED. They can be safely used at temperatures over 3000° F. They are very durable — are highly resistant to spalling and cracking. Some varieties are almost indispensable where flame impingement or violent temperature changes are present.

WHERE INSULATION IS NEEDED. One of these products, ALFRAX BI aluminum oxide material, consists structurally of many hollow spheres. It's one of the best insulating materials at very high temperatures.

WHERE SPECIAL SHAPES ARE INDICATED. Practically all Super Refractories are available either as bricks or special shapes molded to close tolerances — including fitted joints, tubes, etc.

Do any of these suggest possible applications?

materials of construction than grinding wheels

The important thing about Super Refractories by CARBORUNDUM is NOT just that they are "better" than standard fireclay refractories. The important thing is that they are actually a *class apart* — with many entirely different properties and applications. (For example, some of their properties — such as abrasion resistance — are important regardless of whether high temperatures are involved.)

Nor is their principal value simply that they cure trouble-spots where other materials (e.g., refractories, metals, etc.) fail to stand up. Their value usually lies in increasing capacity and

reducing overall operating costs. (For example, regenerator checkers made of CARBOFRAX brick absorb and release over 3 times as much heat as checkers made of ordinary refractories when cycles are short.)

WHY NOT CHECK UP? We have a new booklet which outlines the unusual characteristics of these special purpose materials. The coupon will bring you the story — or one of our engineers would be happy to talk over your specific problems. We believe it could be mutually profitable.



This advertisement — one of a series — is presented in the belief that in the unusual properties of the various Super Refractories by CARBORUNDUM lies the key to many new or improved processes. We would like to talk over specific jobs with anyone who sees such possibilities.

Dept. H-81
Refractories Div., The Carborundum Co.
Perth Amboy, New Jersey

Please send your free booklet on properties of
Super Refractories

Name

Position

Company

Street

City Zone State

YOU CAN BE SURE... IF IT'S Westinghouse



Ignitron Rectifiers— Show Best Conversion Efficiency

Perfected by Westinghouse engineers in 1937, Ignitrons today are the chemical industry's Number One conversion method. They show the best conversion efficiency, lowest first cost for operation above 200 volts, and supply many cells in series. Ignitrons require very little maintenance and human attention (many installations are unattended). Shown at left: twelve Ignitron assemblies supply 60-thousand amps at 525 volts to electrolytic cells.



Motor-Generator Sets— Have Wide Voltage Range

Once the leader in power conversion, M-G sets are still important where high current or variable d-c output voltages are needed. Voltage is easily regulated by controlling the generator field. For supplying 100 to 200 volts to cells in series, M-G sets have highest conversion efficiency. At left are five Westinghouse M-G sets which feed 50,000 amps to cells producing magnesium.

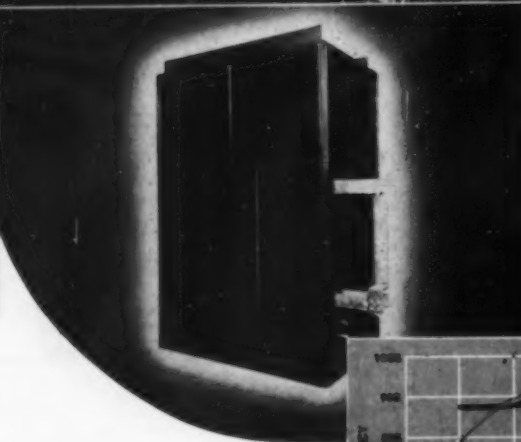
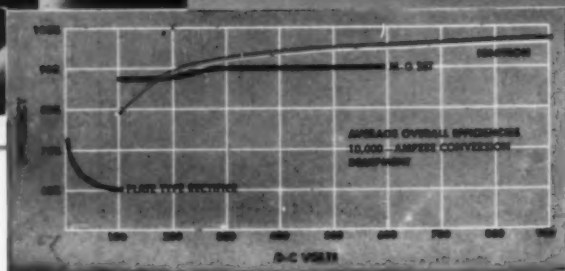


Plate-Type Rectifiers— Permit Precise Cell Control

Copper-oxide and Selenium Rectifiers are best for low-voltage power (25 volts and under) for a small group of cells. They permit unusually precise cell control. Units are suited to variable output voltage. They require practically no maintenance and can readily be set up for automatic operation. Shown at left is a Selenium Rectifier for electrolytic operations. Interior of this unit is pressurized to prevent entry of corrosive gases.



ARE YOU WASTING MONEY IN POWER CONVERSION?

Conversion Method Has Big Effect on Power Costs, Cell Operation

In a big electrochemical operation, a 5% difference in conversion efficiency can make a \$20,000 difference in the annual power bill. A small improvement in voltage regulation can make major improvements in cell operation. So selecting the *right* conversion method can pay big dividends in power savings, production efficiency, product quality and equipment maintenance.

Westinghouse Makes All Three; Gives Unbiased Advice

Almost every electrochemical process is different—and the tricky problem is matching the conversion equipment to the needs of your operation. Here's where Westinghouse can really help—because we've had a great deal of experience in

the manufacture and application of *all three* important conversion methods. We know the advantages and best operating practice for each—Ignitrons, motor-generator sets, and plate-type rectifiers. Thus we can give you expert, *unbiased* advice in selecting new equipment or getting the most out of your present installation.

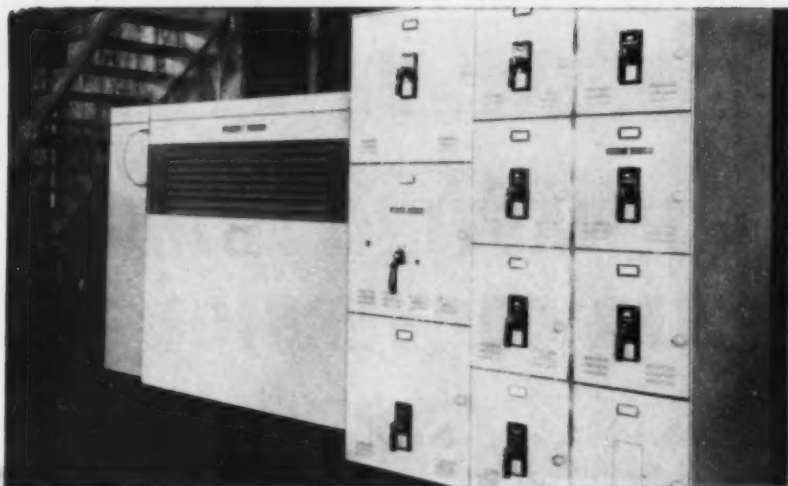
Review Your Operation; Have Westinghouse Help

A thorough study of your present conversion operations could mean big savings. A Westinghouse specialist would be glad to help you review them—with no obligation of course. Just call your Westinghouse office. And when planning new installations, be sure to call in Westinghouse early. Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Penna. J-94857



Westinghouse

EQUIPMENT FOR THE
CHEMICAL INDUSTRY



MODERN G-E LOAD CENTER UNIT installed at the Traylor Engineering and Manufacturing Co., Allentown, Pa. This unit consists of a dry type transformer and switchgear, completely enclosed in steel. Power is received at 2400 volts and stepped down to utilization values. Note placing of unit in waste space under stairway.



BEFORE—AND AFTER! Here are photos of poles that carried the old 240-volt distribution lines, before and after the cables had been removed. The many low voltage cables have now been replaced by a 3-phase cable installed underground.



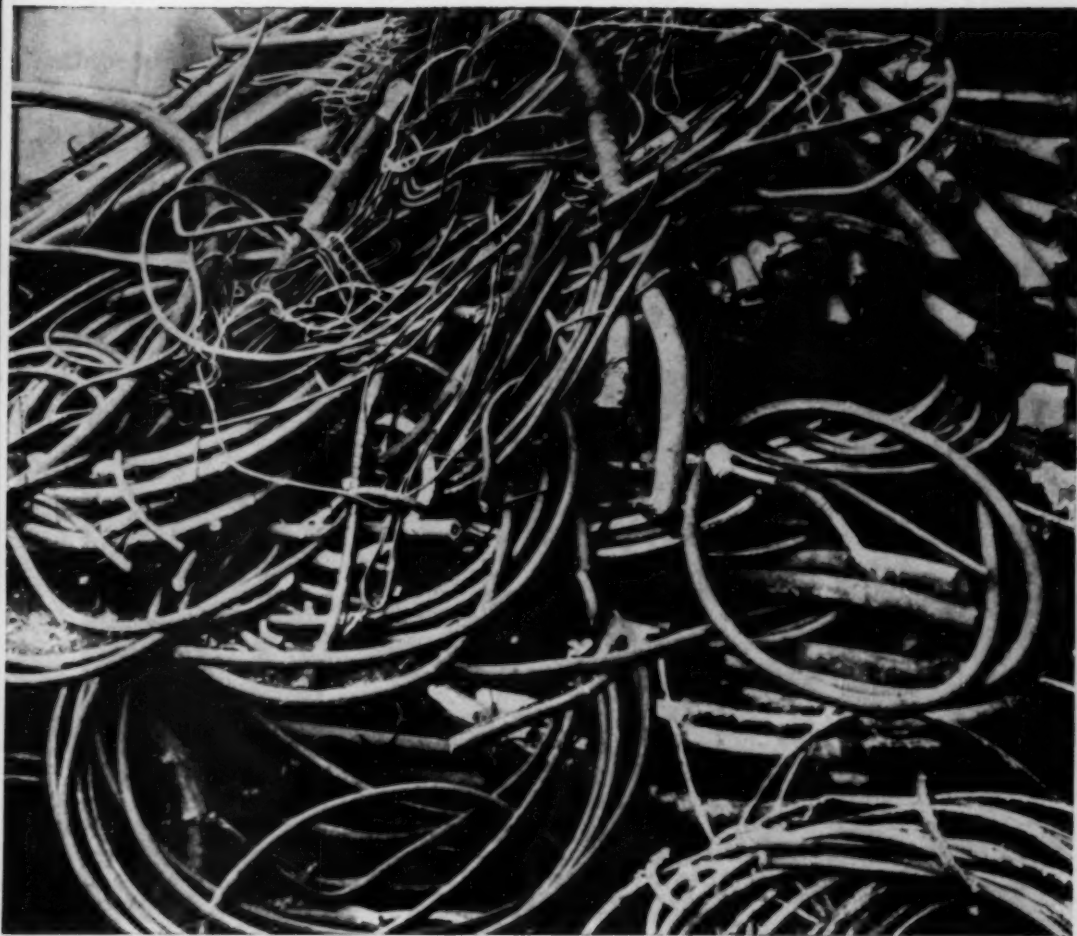
LOAD CENTER SYSTEM



Replacing an octopus of long, heavy 240-volt distribution lines, three small high voltage cables now carry all the power required for expanded, more efficient production at the Traylor Engineering and Manufacturing Co., Allentown, Pa.

If the old system had been continued, more than 10% additional copper would have been required to provide for expansion. This is more than the amount necessary for the new high-voltage cable, which will carry all the power required for years to come.

Today, power is distributed at 2400 volts to various G.E. Load-center unit substations like the one above, where it is stepped down to utilization values. Because load-center units are located close to the machines they serve, secondary feeders are kept short, saving expensive



SAVES TONS OF COPPER

low-voltage copper. Although the new high-voltage lines are more than 90% smaller in size than the old low-voltage distribution cables, they carry considerably more power.

After the new load-center system had been installed, the pile of copper cable shown above was all that remained of the old outdoor, pole-mounted, 240-volt distribution system at the Traylor Engineering & Manufacturing Co. Over and above the

salvage of vital copper in this cable, the Traylor Company actually saved copper in putting in its new high-voltage distribution system.

For complete information on this modern power supply system for your plant, write for Bulletins GEA-3592 Load Center Unit Substations and GEA-3758 Load Center Power Distribution. General Electric Company, Schenectady 3, New York.

GENERAL  **ELECTRIC**

331-78

Specify
SOLVAY

TRADE-MARK REG. U. S. PAT. OFF.

**CALCIUM
CHLORIDE**

- for
- Dustlaying
 - Removing and Skidproofing Ice
 - Concrete Work
 - Refrigeration Brine
 - Drying Air
 - Weighting Tractor Tires
 - Freeze-proofing Coal
 - Freeze-proofing
 - Fire-fighting Equipment

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ALLIED CHEMICAL & DYE CORPORATION

40 Rector Street, New York 6, N. Y.

BRANCH SALES OFFICES:

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Soda Ash • Caustic Soda • Caustic Potash • Sodium Bicarbonate • Chlorine
Potassium Carbonate • Calcium Chloride • Formaldehyde • Ammonium Chloride
Methanol • Specialty Cleaners • Ammonium Bicarbonate • Sodium Nitrite
Hydrazine • Para-dichlorobenzene • Ortho-dichlorobenzene • Monochlorobenzene

WHAT WOULD YOU SPECIFY ...

Fluid	Concentration	Temp.	Type of Valve	Valve Material
1 Sulphuric Acid	20%	120 F.		
2 Sulphuric Acid	100%	180 F.		
3 Hydrochloric Acid	33%	80 F.		
4 Hydrofluoric Acid	30%	125 F.		
5 Sew		300 F.		
6 Oxygen		Ambient		

In several of these cases other body materials or diaphragms would serve as well. But the really important fact is the unmatched versatility of Grinnell-Saunders Diaphragm Valves in handling corrosive fluids, gases, compressed air, food and suspended solids . . . in lines where corrosion, abrasion, contamination, clogging, leakage and maintenance are problems.

Grinnell-Saunders Valve bodies are stocked in cast iron, malleable iron, stainless steel, bronze, and aluminum, with other materials available on special order. Valve bodies can be lined with lead, glass, natural rubber or neoprene. Diaphragms are available of natural rubber and a number of synthetics to suit particular service conditions.

The Grinnell-Saunders Valve Division will be pleased to submit recommendations upon receipt of complete information covering service conditions.

Features of the Grinnell-Saunders Diaphragm Valve

- diaphragm absolutely isolates working parts from fluid
- diaphragm lifts high for streamlined flow in either direction
- diaphragm presses tight for positive closure
- body, lining and diaphragm materials to suit service
- simple maintenance—diaphragm easily replaced



We supplied
Grinnell-Saunders
Diaphragm Valves
with ...

Body Material	Diaphragm Material
1 Rubber lined	Natural rubber
2 Cast iron	KEL-F
3 Glass lined	Butyl
4 Magnesium	KEL-F
5 Polished bronze	White diaphragm
6 Cast iron*	Neoprene

*For oxygen service a low flash point lubricant is supplied. All valves for oxygen service are subjected to 300 lb. air underwater test.

GRINNELL

WHENEVER PIPING IS INVOLVED



Grinnell Company Inc., Providence, Rhode Island

Sales Offices and Warehouses in Principal Cities

pipe and tube fittings • welding fittings • engineered pipe hangers and supports • Thermoliner unit heaters • valves
Grinnell-Saunders diaphragm valves • pipe • prefabricated piping • plumbing and heating specialties • water works supplies
industrial supplies • Grinnell automatic sprinkler fire protection systems • Amco humidification and cooling systems

Life ...on the



WET PAPER IS STRONG PAPER if it is treated with Cyanamid's PAREZ® Resins. These resins not only improve the wet strength of paper, but increase its dry strength as well. Thus, the uses for paper are broadened, its dependability increased in such applications as grocery bags, frozen food containers, napkins, wiping cloths, map and blueprint papers...to mention a few. Perhaps PAREZ Resins can improve the quality of your paper products.

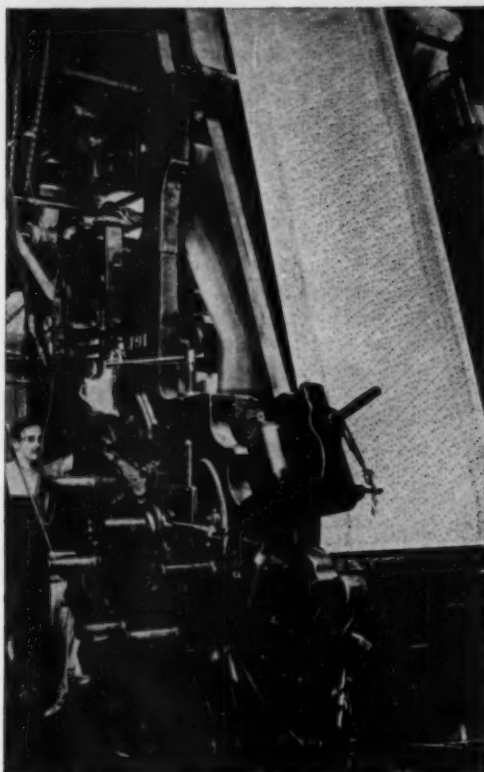


CRABGRASS-FREE LAWNS are the aim of every true lawn lover. Today, thanks to Potassium Cyanate, a recent Cyanamid development, a simple method of killing crabgrass is available to everyone. The effectiveness of Potassium Cyanate has been proved in extensive tests by Agricultural Experiment Stations and Turf Specialists. It is not dangerous to children or pets and is easily sprayed on for overall or spot coverage. Write for complete information.



600 TONS PER HOUR of sulfur or bauxite can be handled by this new ship unloader installed at Cyanamid's Warners Plant in Linden, New Jersey. Consisting of an unloading tower and a new type of boom stacker with auxiliary conveying and distributing equipment, this installation has reduced previous handling time by 50%. The use of the newest methods and equipment is part of Cyanamid's continuous effort to increase operating efficiency and lower production costs.

Chemical Newsfront

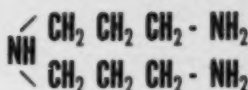


COLORLED COTTON FABRICS are supplied in numerous, appealing designs by high speed machines like the one shown. The colors used must meet high standards—superior aniline blacks, for example, made from Cyanamid's AERO* Brand Yellow Prussiate of Soda and Yellow Prussiate of Potash. These blacks, in combination with vat dyes, rapid fasts and steam colors, possess good printing properties for both cotton and rayon, producing dense tones with a minimum tendering of the fabric.

* Trade-mark

NEW PRODUCT NEWS

3, 3'-Iminobispropylamine



This compound is a colorless, high boiling, strongly basic amine. It does not discolor as rapidly on storage as most compounds of this type, an indication of greater resistance to air oxidation. It is completely miscible in water, alcohols, hydrocarbons, and most other common organic solvents. Possible uses: synthesis of ion-exchange resins and as an intermediate in pharmaceuticals and dyestuffs.

American Cyanamid Company
30 Rockefeller Plaza, New York 20, N. Y.

CE 8-51

Please send literature or further data on the items checked:

- ☐ PAREZ Resins
- ☐ Potassium Cyanate
- ☐ 3,3'-Iminobispropylamine

Name..... Position.....

Company.....

Address.....

City..... State.....

In Canada: North American Cyanamid Limited,
Toronto and Montreal

AMERICAN Cyanamid COMPANY



A gearturbine built to save...

Three ways



The Westinghouse Gearturbine costs less to buy... less to install... and less to maintain. Wrapped up in a single package is a compact, rugged and reliable speed-reduction unit solidly coupled to a Type E turbine. It's the ideal combination for ratings up to 500 hp and output speeds commonly found in single-ended applications.

Here's economy made possible by a standardized design that cuts manufacturing costs... avoids costly specials... saves space... and simplifies maintenance. And you get the maximum flexibility possible... any combination of three turbine wheel sizes, three gears and three types of governor can be used according to your needs.

Other plus features are... solid coupling of turbine shaft to pinion shaft; single-helical gearing; forced circulation, filtered oil; and 3-point support for easy mounting and leveling.

J-50521

GET THE FULL STORY. A newly available booklet, B-4346, clearly explains the applications, refinements and advantages of Westinghouse Gearturbines. Ask your nearby Westinghouse representative for your copy, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.



YOU CAN BE SURE... IF IT'S
Westinghouse

TYPE E Turbines

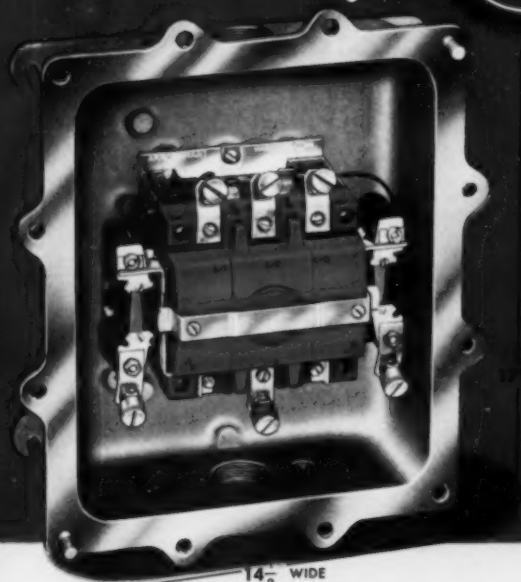
BRING OUT **BUILT-IN PERFORMANCE** OF MOTORS, MACHINERY
AND EQUIPMENT FOR **MAXIMUM SAFETY**

Presenting



EXPLO-SAFE

AND WEATHERPROOF
MOTOR STARTER LINE
FOR USE WHEREVER
HAZARDOUS CONDITIONS EXIST



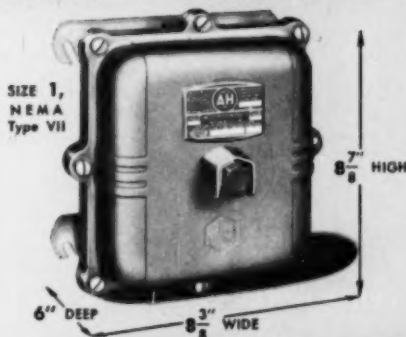
SIZE 2,
NEMA
Type VII
1 1/2" DEEP
1 1/2" HIGH
1 1/2" WIDE

- 2/3 the SIZE
- 2/3 the WEIGHT
- SUPERIOR PERFORMANCE
- HIGHEST RESISTANCE to CORROSION
- STARTER and CONTACTOR SIZE
1, 2, 3, 4

14 1/2" WIDE

COMPLETE LINE • UNIFORM DESIGN

Wherever hazardous conditions exist, specify and buy the finest motor control for machinery and equipment — EXPLO-SAFE MOTOR STARTERS by ARROW-HART. In a new, improved cast Feraloy enclosure, these "RA" Magnetic Starters, acclaimed by design-engineers, manufacturers and electricians alike for outstanding performance, are now available in NEMA Type VII, Class I, Group D; Type IX, Class II, Groups E, F, G; and Type IV. Consider these important features — (1) Feraloy housings, possessing high tensile strength and unusual resistance to corrosion, are cast of a special alloy by Crouse-Hinds. (2) Just 2/3 the size of outmoded solenoid type starters. (Compare dimensions listed on reverse side.) This means new opportunities in layout and more compact control centers. (3) Just 2/3 the weight is welcomed by installation and maintenance crews. (Compare weights on next page.) Accumulated floor load is materially reduced. (4) Right Angle design innovations combined with alkyl hood and base assure full protection. For additional information note EXPLO-SAFE folder offer and product data on following page.



SIZE 1,
NEMA
Type VII

8 7/8" HIGH

6" DEEP 3 3/8" WIDE

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APPROVED BY THE UNDERWRITERS' LABORATORIES

THE ARROW-HART & HEGEMAN ELECTRIC CO.
HARTFORD CONNECTICUT

BRANCHES AND WAREHOUSES IN PRINCIPAL CITIES

ELECTRICAL CONTROL



ESTABLISHED IN 1890

**ELIMINATE
COSTLY INSTALLATION
PROCEDURE**



**PROVIDE
MAXIMUM SAFETY
WITH**

EXPLO-SAFE®



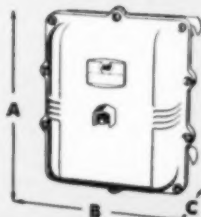
INSTALLING
SIZE 2
EXPLO-SAFE
STARTER

**COMPLETE LINE OF MOTOR CONTROLS
FOR OUTSTANDING PERFORMANCE IN
HAZARDOUS LOCATIONS**

SMALL IN SIZE LIGHT IN WEIGHT

There's increased protection for hazardous locations with Arrow-Hart's new EXPLO-SAFE and Weatherproof Magnetic Starters . . . a complete line of uniform design available in NEMA Type VII (Explosive Gas), Type IX (Explosive Dust) and Type IV (Weatherproof). There's superior performance, too, in the "RA", Right Angle, operating mechanism . . . a revolutionary design that accounts for 2/3 reduction in size and weight. Straight-thru front wiring . . . simple parts replacement with ample working space . . . make these starters easier, less costly to install and service. Heavy-duty contacts; simple, sturdy construction; guided-alignment — all combine to give you long, dependable service in the smallest motor starter line on the market.

**COMPARE
WITH MOTOR
STARTERS
NOW EMPLOYED**



ARROW-HART EXPLO-SAFE PUSH BUTTON STATIONS



In hazardous locations for circuits up to 600 volts A.C. maximum. Push Buttons are available in variety of arrangements and contact requirements. Rotary type selector switch provides 2 or 3 position operation. Pilot lights with colored lenses also available. Stations custom assembled from stock parts for your specific needs.

TYPE 27W-8

DIMENSIONAL AND WEIGHT DATA FOR ACROSS-THE-LINE STARTERS

SIZE	A—HEIGHT	B—WIDTH	C—DEPTH	TOTAL WEIGHT (lbs.)
NEMA Type VII, Class I, Group D, Explosive Gas and Vapors				
0	8 ⁷ / ₈	8 ³ / ₈	6	18
1	8 ⁷ / ₈	8 ³ / ₈	6	18
2	14 ¹ / ₈	11 ³ / ₈	7 ⁵ / ₈	59
3	17	14 ¹ / ₂	9 ¹ / ₈	106
4	23	17 ¹ / ₂	11	233
NEMA Type IX, Class II, Groups E, F, G, Explosive Dust, Fibers and Flyings				
0	8 ⁷ / ₈	8 ³ / ₈	5 ⁵ / ₈	14
1	8 ⁷ / ₈	8 ³ / ₈	5 ⁵ / ₈	14
2	13 ³ / ₈	11 ³ / ₈	6 ¹ / ₂	34
3	15 ³ / ₈	13 ³ / ₈	8 ¹ / ₈	52
4	22	17	9 ¹ / ₂	132
NEMA Type IV, Weatherproof				
0	8 ⁷ / ₈	8 ³ / ₈	5 ⁵ / ₈	14
1	8 ⁷ / ₈	8 ³ / ₈	5 ⁵ / ₈	14
2	13 ³ / ₈	11 ³ / ₈	6 ¹ / ₂	34
3	15 ³ / ₈	13 ³ / ₈	8 ¹ / ₈	52
4	22	17	9 ¹ / ₂	132

APPROVED BY UNDERWRITERS' LABORATORIES

WRITE TODAY—FOR COMPLETE ENGINEERING DATA ON EXPLO-SAFE STARTERS

ARROW-HART

THE ARROW-HART & NEWMAN
ELECTRIC COMPANY
100 HAWTHORN STREET
HARTFORD 6, CONNECTICUT, U.S.A.

BRANCHES IN: BOSTON, CHICAGO, CLEVELAND, CINCINNATI, DALLAS, DENVER, DETROIT, LOS ANGELES, NEW YORK, PHILADELPHIA, SAN FRANCISCO, ST. LOUIS, St. Paul
In Canada: ARROW-HART & NEWMAN (CANADA) LTD., MT. DENNIS, TORONTO

PRINTED IN U.S.A.





Vibrin case history

...that opens up new polyester potentials

In the dramatic history of plastics, it is difficult to single out the stars. Yet, certainly, the rise of polyester plastic resins has made one of the most exciting stories.

In the few years from 1946 to 1950, polyester sales have grown from 1½ million pounds to 7½ million pounds—a full five-fold increase!

Polyesters are taking over the manufacture of hundreds of products—tubing, fishing rods, boat hulls, trailer

parts, lamp shades, furniture, stand-up screens, light diffusers, aircraft parts, many, many more. Again and again, polyesters have introduced *higher product quality and lower production cost.*

Just as an example, see what Naugatuck's new Vibrin polyester has done for the battery boxes produced by Lanfare Molded Products, Inc., Toledo, Ohio, for the Nu-Form Battery Corporation, Port Clinton, Ohio. Then send the coupon below for the facts about what Vibrin can do for *your* product.

Vibrin has made battery boxes light, strong, heat-resistant and corrosion-resistant. And it can produce them more rapidly.

What's behind all this? See the notable list of Vibrin properties given here. Vibrin is a product of the Naugatuck Chemical Division of the United States Rubber Company. Insure your plastics future on the *solid* base of Naugatuck—a reliable source of quality products with which you can build lasting leadership in the years to come.

Some outstanding Vibrin properties: Easy to handle—lightweight finished products • Cures without porosity • 100% reactivity—no weight change • Electrical grades—low water absorption • Wide hardness range • Full color range • Flame-resistant types

Naugatuck Chemical

Division of UNITED STATES RUBBER COMPANY
NAUGATUCK, CONNECTICUT

BRANCHES: Akron • Boston • Charlotte • Chicago • Los Angeles • New York
Philadelphia • In Canada: Naugatuck Chemicals, Elmira, Ontario

MARVINOL vinyl resins • KRALASTIC styrene copolymers • VIBRIN polyester resins

CHEMICAL ENGINEERING—August 1951

Naugatuck Chemical Plastics Division, Elm St., 25,
Naugatuck, Conn.
Without charge, send technical data on properties, uses,
handling methods (specify desired end products).

I understand that, from this data, I can order
suitable, free experimental samples.

NAME _____ TITLE _____

COMPANY _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

SIMPSON Mix-Mullers



PROVED IN USE

**...on hundreds of chemical
process mixing problems!**

BECAUSE it provides uniform results, the "controlled mixing" process accomplished by Simpson Intensive Mix-Mullers has become an integral part of mixing operations involving dry, semi-plastic and pasty materials requiring rapid, thorough, and uniform mixing and blending without grinding. The smearing, rubbing, and kneading action of these dependable mixers quickly develops maximum bond strength and plasticity in a mix.

Some of the product applications where Simpson Intensive Mix-Mullers are being used successfully include boiler compounds, carbon electrodes, catalysts, crayons, crucibles, glass batching, graphite products, mercury reclamation, paper coatings, pencil leads, putties, silicon carbide refractories, soaps, special shape refractories, storage battery plate pastes, and welding rod coatings.

Ask to have a National Engineer analyze your specific mixing problems... or send for a copy of our Chemical Process Mixing Catalog.



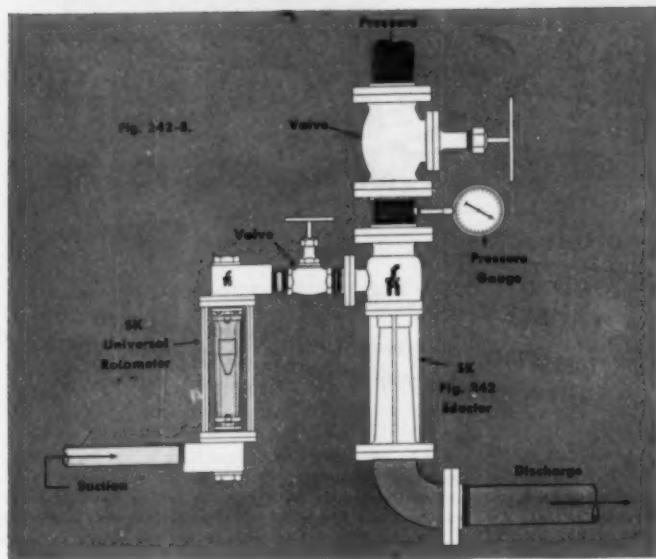
SIMPSON Mix-Muller® División





News

HERE'S AN EASY WAY TO MEASURE AND MIX LIQUIDS INTO CONTINUOUS STREAMS

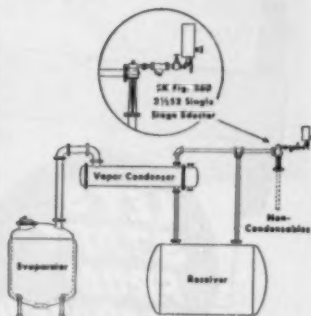


THE system above is simplicity itself. It consists of a SK Rotameter and a SK Jet Eductor. It represents only one of numerous possible variations. With this system, you can mix two liquids in desired proportion in one continuous operation.

Flow of the pressure liquid is controlled by a valve and the orifice of the eductor nozzle. The pressure liquid passes through the eductor nozzle with sufficient velocity to draw in and entrain the suction liquid. Rate of flow of the suction liquid is measured by the Rotameter and controlled by a valve in the suction line. Both liquids are thoroughly mixed within the eductor and are discharged through the discharge line. The mixing ratio remains constant as long as the pressure is held constant.

Of importance is the fact that the eductor has no moving parts—the Rotameter but one, the rotor. Maintenance, therefore, is low. Operation is consistently efficient. In addition, the eductor can be made of special materials to handle corrosive liquids. The system is flexible. Additional liquids can be mixed by extending the system. SK Controlling Rotameters can be used in pressure and suction lines to proportion flows under changing conditions.

The SK Rotameter and Eductor illustrated are stock items, immediately available. Many other types and a wide range of sizes of both are offered. For details on Jet Eductors, request Bulletin 2-M. For information on all types of Rotameters, request Bulletin 18-RA. We'll send you either or both, promptly.



ACID RECOVERY UNIT SAVES COMPANY MONEY

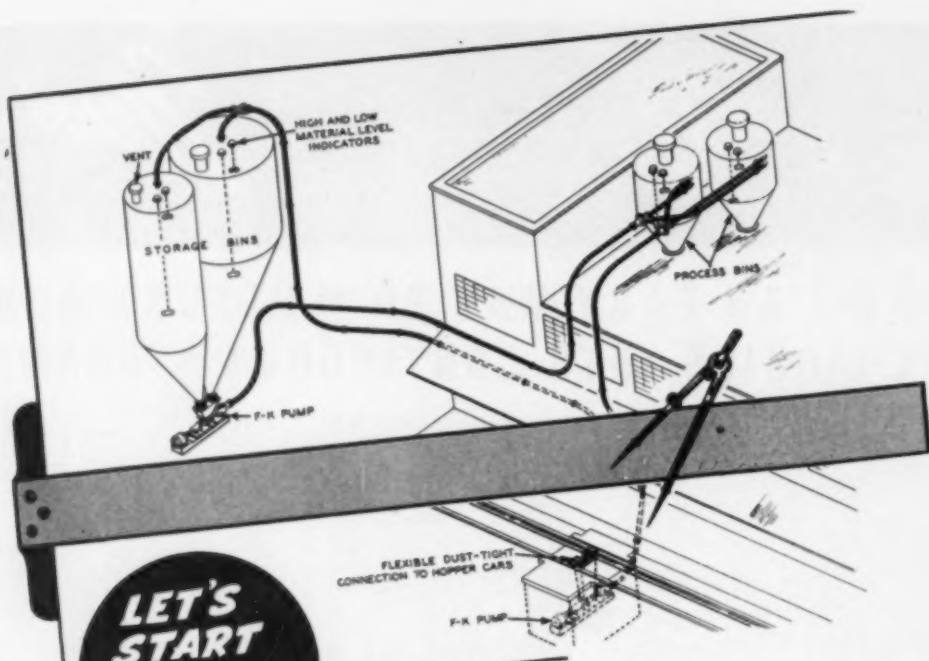
Story by courtesy of The Pfaudler Company

A large automotive parts manufacturer saves \$50.00 a day with the installation pictured. It's a glass lined vacuum concentrator for recovering chromic acid and it was built by The Pfaudler Company, Rochester, N. Y.

Asked to suggest a method for recovering the acid used to wash automotive parts after a plating bath, Pfaudler Engineers recommended and installed this unit. Stainless steel and glass lined components are used to resist corrosion. A SK Fig. 560 Single Stage Jet Exhauster is used to maintain 26" Hg. vacuum in the system while removing non-condensables.

For details on the complete system, write to The Pfaudler Company. For details on SK Exhausters, write to SK for Bulletin 3-EH.

Manufacturing Engineers



**LET'S
START
FROM
SCRATCH**

PROBLEM—conveying
SOLUTION—to design and build a system that
will meet your requirements, better your operation

Fuller Company occupies a unique position in the field of pneumatic conveying of dry pulverized and granular materials. It designs and manufactures four primary types, from which it can select that best adapted to specific requirements; in other words, equipment best suited to do the work most efficiently and economically, with the materials to be handled.

Each job should be considered separately. That's why we say, "Let's start from scratch" . . . when the plant is in the design stage. A preliminary study should be made of local conditions, so that proper equipment can be recommended. The selection of the type of equipment, and its layout, best adapted to satisfy any individual set of conditions, should be

made by specialists of wide experience in the engineering of pneumatic conveyors. We strongly urge all prospective purchasers to avoid the preliminary engineering, but to permit us to submit a recommendation, or engineering study, comprising a proposal drawing and estimate for your approval, or the approval of your consulting engineers.

Fuller Company has a tangible resource in the years of experience and training of its personnel in all phases of pneumatic conveying. Its engineers are at your service, ready to make studies of your requirements, and suggest means for the betterment of your operation. You're under no obligation for this service.



FULLER-KINYON



AIRVEYOR



FULLER-FLUXO



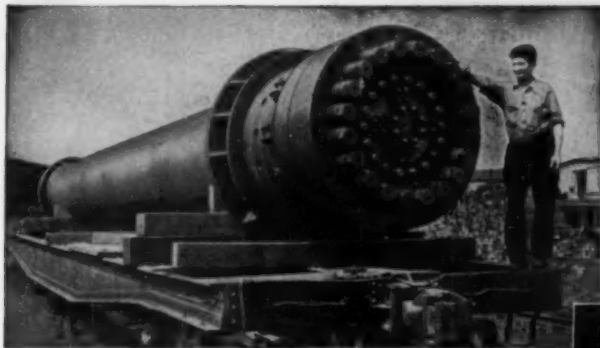
F-H AIRSLIDE

DRY MATERIAL CONVEYING SYSTEMS
AND COOLERS-COMPRESSORS
AND VACUUM PUMPS-FEEDERS,
AND ASSOCIATED EQUIPMENT

G-67

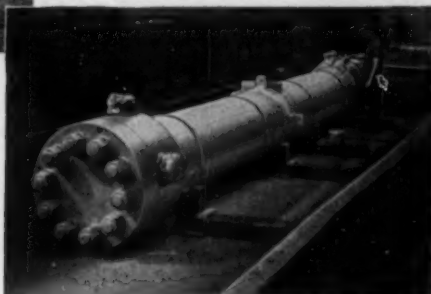
Fuller

FULLER COMPANY, Catesauqua, Pa.
120 So. LaSalle St., Chicago 3
420 Chancery Bldg., San Francisco 4



One of several MULTI-LAYER Converters designed for 5000 psi working pressure, with corrosion-resistant type 403 alloy inner shell. Wall thickness $\frac{3}{4}$ inches, weight 182,000 lb. This type of construction is ideal for high pressure synthesis of coal and shale.

MULTI-LAYER Heat Exchanger designed for 5100 psi working pressure. Wall thickness $\frac{1}{2}$ inches, weight 43,800 pounds.



A.O. Smith MULTI-LAYER Heat Exchangers & Pressure Vessels

The practical, economical solution to your high pressure process and storage requirements

MULTI-LAYER vessels are built-up from concentric layers of relatively thin steel plate, progressively wrapped, tightened and welded around an inner, pressure-tight cylinder.

Greater range of process possibilities for the planning and design engineer are provided in this unique, patented construction.



Walls can be made stronger merely by increasing strength of steel wrapping plates or by adding more layers.

For corrosive service, only the inner cylinder need be fabricated of alloy or non-ferrous materials.

No size or weight limitations as MULTI-LAYER vessels or heat exchangers can be made in any diameter for which satisfactory end closures are available.

The full calculated strength of the steel is more fully utilized in MULTI-LAYER vessels. Wrapping tension and weld shrinkage develop compression in the inner layers.

This results in more equalized loading of all portions of the vessel wall under working pressure.



Safety is greatly improved by MULTI-LAYER construction. Only the inner cylinder need be pressure tight! Outer layers are provided with vent holes which protect the vessel against damage from over-pressure. In the remote event of run-away overload sufficient to cause failure, there is little danger of fragmentation of the vessel wall, due to the nature of MULTI-LAYER construction.



Consult A. O. Smith for assistance on your heat-exchanger or pressure-vessel problems. In any event, write for Bulletins V-52 and V-53 for more complete information on MULTI-LAYER Pressure Vessels and their construction... or use handy coupon.



A.O. Smith

VESSELS • HEAT EXCHANGERS

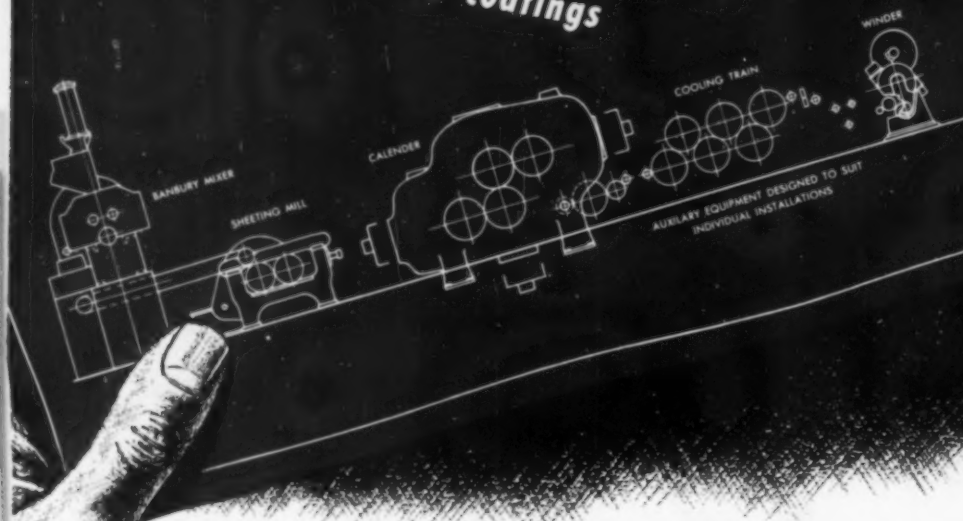
Boston 16 • Chicago 4 • Cleveland 15 • Dallas 2 • Denver 2
Houston 2 • Los Angeles 22 • Midland 5, Texas • New Orleans
New York 17 • Philadelphia 3 • Pittsburgh 19 • San Francisco 4 • Seattle 1
Tulsa 3 • Washington 6, D.C. • Milwaukee 1, Wis. • International Division:
Box 2023, Milwaukee 1

A. O. Smith Corporation
Dept. CE-83, Milwaukee 1, Wis.

Without obligation, send me Bulletins V-52 and V-53 on your MULTI-LAYER Pressure Vessels and their construction.

Name _____
Firm _____
Street _____
City _____ State _____

MATCHED PRODUCTION UNIT for processing plastic film and coatings



Farrel-Birmingham engineers will be glad to help you select individual machines or combination units best suited for your specific requirements.

The processing setup shown in the blueprint was developed some time ago by Farrel-Birmingham engineers, working with plastics manufacturers, to synchronize the progressive steps in the production of plastic film and coatings.

Since then, many installations of these *Matched Production Units* have been made in plastics plants. In fact, the combination has given such satisfactory service that it has become the generally accepted unit for this type of production.

The unit shown consists of a size 3A Banbury mixer, a 22" x 60" mill, a 28" x 66" four-roll, Z-type calender and the neces-

sary auxiliary equipment. The output of the Banbury provides full-time operation without overload to the mill, assuring an even flow of properly conditioned material to the calender. The calender is in ideal balance with the other two machines. Its output speed may be adjusted according to the gauge of stock being run. Where greater or lesser output than is provided by this setup is required, larger or smaller machines with matched capacities are available.

FARREL-BIRMINGHAM CO., INC., ANSONIA, CONN.

Plants: Ansonia and Derby, Conn., Buffalo, N. Y.
Sales Offices: Ansonia, Buffalo, New York, Akron,
Chicago, Los Angeles, Houston

Farrel-Birmingham®

FB-668

Turn Waste into PROFITS!



**Pritchard's Single
Responsibility Contract
Includes**

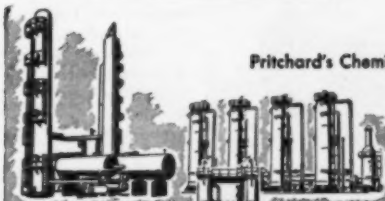
**Design
Engineering
Purchasing
Field Construction
Guarantees
Operating Tests**

Now you can turn *waste* into *profit*—liability into asset—with a Pritchard Sulphur Recovery Plant!

If your plant flares off 20 tons or more per day of waste hydrogen sulphide, it will pay you to investigate our method of converting a dangerous liability (air pollution) into a highly profitable asset (elemental sulphur).

With a Pritchard Two-Stage Plant you can recover 93 to 95% of the sulphur present in refinery gas or natural gas. Such a plant can easily be a one man operation, and is especially adapted to areas where the supply of water is low or at a premium.

Today's supply of sulphur is extremely short, tomorrow's may be critical! Consult *now* with Pritchard's experienced engineers for specific recommendations on how a Pritchard Sulphur Recovery Plant can be put to work for you.



Chemical Division
Power Division
Petroleum Division
Natural Gas Division

Pritchard's Chemical Division is eminently qualified to handle all elements of your project effectively and economically.
We invite your specific inquiry.



J.F. Pritchard & Co.

DESIGN • ENGINEERING • CONSTRUCTION

Dept. No. 139

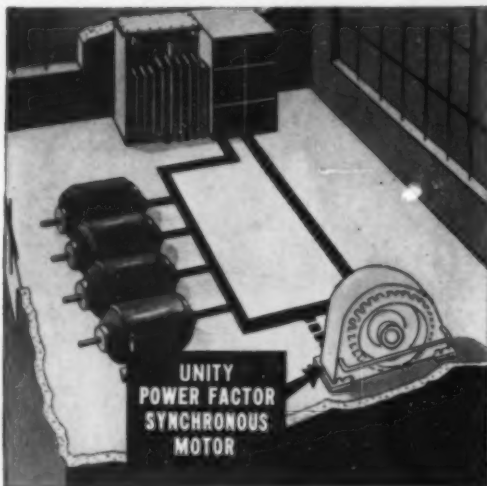
908 Grand Ave., Kansas City 6, Mo.



District Offices: CHICAGO • HOUSTON • NEW YORK • PITTSBURGH
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How to get more out

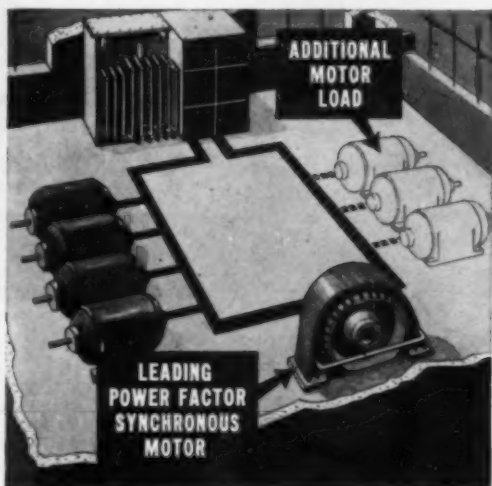
... install G-E Synchronous Motors



If your plant power system is loaded close to full capacity and you have a place where a large constant-speed motor can be used, you may be able to install a *unity power-factor* synchronous motor without increasing the kva load on your system.

Or, if your power system is already overloaded, then a *leading power-factor* synchronous motor can actually supply kvars to your system while performing its usual drive duties. Then you can often install additional inductive apparatus to an existing system without fear of overloading feeder lines.

If you are planning plant expansion or you need more motors and/or suspect power system overloading, contact the nearest G-E sales engineer. He'll help you survey your system, and help you determine the type of synchronous motor you need—should this be one answer to your power system problems. *General Electric Company, Schenectady, N.Y.*



NEW! A Helpful Training Course on Motors!

Everyone concerned with technical training problems will want this new G-E Motor Selection and Application Course. Consists of 9 short, easily understood lessons. Complete kit—slide films, review booklets and instructor's manual—\$100. Call or write your nearest G-E sales office, or send for free copy of 96-page instructor's manual.

Look at the scope of this Course

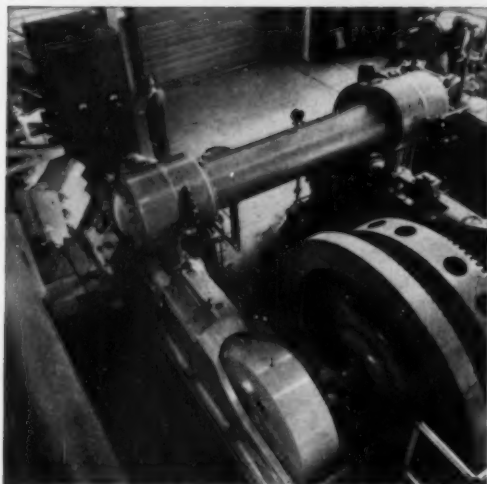


1. Fundamentals of Motors
2. Types of Motors
3. Fundamentals of Selection
4. A-c Induction Motors
5. Single-phase Motors
6. D-c Motors
7. Synchronous Motors
8. Adjustable-speed Drives
9. Gear Motors

GENERAL  ELECTRIC

of your power system

for unity and leading power-factor drives



Control, too, will protect your system—G-E Limitamp high-voltage control provides ample interrupting capacity, protection for operating personnel, good appearance, and compactness. Here it controls and protects a 350-hp G-E synchronous motor.



Check power factor on individual circuits—easily, quickly—with new G-E hook-on power-factor meter. This portable instrument hooks around the line—no cutting of conductors, no costly shutdowns to make power checks. You can accurately locate those circuits where corrective action is needed.

G-E SYNCHRONOUS MOTORS ARE DRIVING

pumps	saws
compressors	generators
Jordans	rolling mills
beaters	pulp refiners
crushers	chippers
ball mills	flour mills
tube mills	stock refiners
large conveyors	line shafts
blowers	fans

in all types of industries where their efficiency, low first cost, and reliability make them exceedingly popular.

General Electric Co. Sect. A 770-25
Schenectady 5, N. Y.

Please send me the following literature. . .

- ☐ for reference purposes
☐ for planning an immediate project
- () GER-234—Synchronous Motors Do Two Jobs at One Time
() GEA-5332—Low-speed Synchronous Motors
() GEA-5426—High-speed Synchronous Motors
() GEA-5469—G-E Testing Instruments
() GEZ-310—Motor Training Course Instructor's Manual

Name

Company

Address

City State

mail this coupon today



Air view of the Corn Processing Division, Clinton, Iowa. Many OIC Valves are working through this plant.



At CLINTON FOODS Inc. Makers of Fine Corn Products

For many years, OIC Valves have been going into this food processing plant, as Clinton Foods Inc. expanded some operations, modernized others—keeping all at the peak of production. The Ohio Injector Company is proud to have shared in this program.

Because OIC Valves are *precision engineered* and *precision built*, you can specify OIC Valves and be assured of efficient, precise control. The Ohio Injector Company, Wadsworth, Ohio.



VALVES

FORGED AND CAST STEEL • IRON • BRONZE



Specify **PLIOWELD**

for permanent anti-corrosion protection



TYPICAL USES OF PLIOWELD

Processing Tanks —
rectangular, round, square
Tank Covers — flat, box,
radius types
Storage Tanks — open top,
flat or dished heads
Truck Tanks
Railroad Tank Cars
Fans — wheels and housings
Flanged Pipe
Flanged Pipe Fittings
Ductwork
Scrubbers — air purifiers
Agitators
Continuous Vacuum
Filters
Troughs and Chutes
Pumps
Filter Frames
Moisture Eliminators
Miscellaneous Fabricated
Items
*Ploweld can also be used
to combat abrasion*

WHEREVER metal is used to store, process or transport corrosive chemicals — solutions of inorganic acids, salts and alkalis; metal plating solutions; organic materials — it can be *permanently protected* with PLIOWELD rubber lining.

Every PLIOWELD installation is especially formulated after careful analysis of the specific operation by the G.T.M. — Goodyear Technical Man. To consult him on *your* problems, get in touch with your nearest Goodyear Industrial Rubber Products Distributor, or write Goodyear, Akron 16, Ohio.

Ploweld—T.M. The Goodyear Tire & Rubber Company

7 REASONS WHY THE G.T.M. SPECIFIES PLIOWELD

1. Effectively seals in corrosives that cannot be handled in metal
2. Bonds permanently to metal surfaces — an exclusive Goodyear process
3. Does not split or loosen with vibration or severe external impacts
4. Does not crack or buckle under alternate wetting and drying or under temperature changes
5. Surface will not disintegrate or slough off
6. Protects chemicals from discoloration, iron "pickup" and other contaminations
7. Each installation specially formulated to provide maximum protection against chemical handled

GOOD YEAR

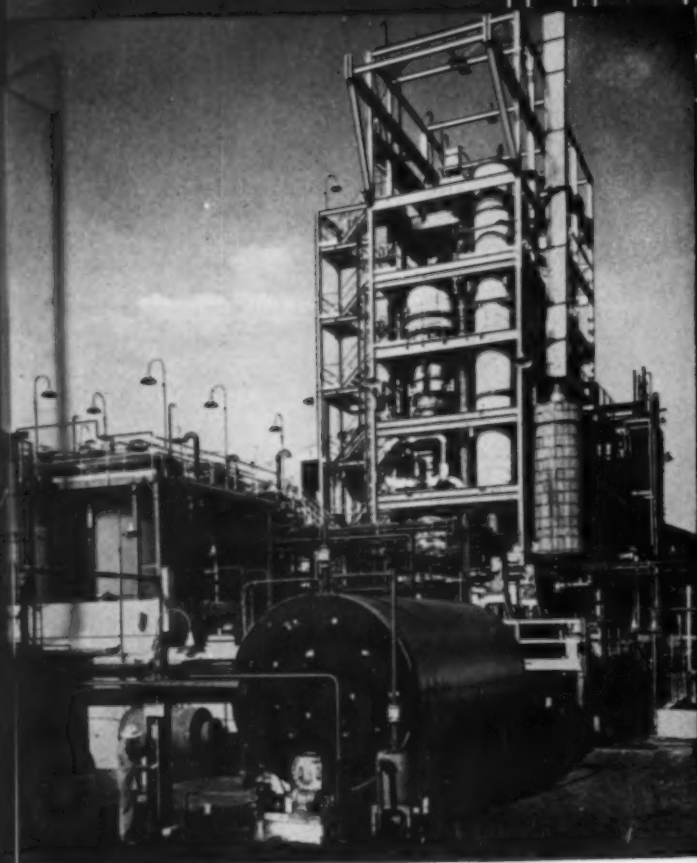
THE GREATEST NAME IN RUBBER



PRESENTATION



THE MODERN



*Part of the production facilities for Plexiglas at
the Rohm & Haas Company plant at Bristol, Pa.*

APPROACH TO

Polymerization

CONTROL



**BROWN
INSTRUMENTATION**

... is patterned to the exact requirements of individual plants and processes.

... is the result of engineering and application know-how, with one responsibility from sensing elements to control valves.

... is backed by a nation-wide field engineering and service organization.

THE tremendous increase in the use of synthetic resins and rubbers has resulted in a greatly accelerated production of vinyl type and other polymers. Keeping pace with this gigantic effort is the production of Plexiglas at the modern Rohm & Haas plant at Bristol, Pa. Every significant step in this polymerization process is synchronized by an efficient system of Brown Instrumentation. From a centrally located panelboard, the instruments insure precise control of exothermic reactions, as well as other operations, by automatic supervision of all critical process variables.

When looking for recording and controlling in-

struments for your polymerization process, or any chemical process—consider first:

**The Brown know-how developed through many years of application experience in the industry.*

**The completeness of the Brown approach—recorders, controllers, panelboards (including Graphic Panels), valves and accessories.*

Call in our local engineering representative for a detailed discussion of your process control requirements . . . he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR Co.,
Industrial Division, 4478 Wayne Ave., Philadelphia 44, Pa.

MINNEAPOLIS
Honeywell

Brown Instruments

DAVISON PRODUCES SPECIAL OXIDATION CATALYST

**Yields Increased . . . Costs Lowered . . .
Complete Restriction of Information**

For a two year period a manufacturer had worked on the problem of developing an oxidation catalyst for their own use. Their basic research was presented to a Davison Field Service Engineer as a laboratory prescription. This material was completely and confidentially coordinated with Davison's Technical Service and Research Departments. Pilot plant samples were manufactured enabling further research to be accomplished on the manufacture of the catalyst. Top men in the catalyst field worked on the development of this oxidation catalyst and after six months it was manufactured for large scale commercial use.

Because of Davison's modern facilities and extensive experience, the oxidation catalyst was produced at greatly reduced cost yet provided top yields. At no time was restricted information in danger of being divulged.

This is an example of how Davison's specialty catalyst development and production works. If you have a catalyst problem, contact the Davison Field Service Engineer. You can rely on Davison to work with you, confidentially.

Progress Through Chemistry

THE DAVISON CHEMICAL CORPORATION

Baltimore 3, Maryland

PRODUCERS OF: CATALYSTS, INORGANIC ACIDS, SUPERPHOSPHATES, PHOSPHATE ROCK, SILICA GELS, SILICOFLOURIDES AND FERTILIZERS

Stays Tight

WHEN THE GOING IS TOUGH



Titeflex

ALL-METAL FLEXIBLE TUBING

If you use tubing to convey liquids, gases or semi-solids, Titeflex can help you do it better and at less cost. Titeflex flexible tubing is made in brass, bronze, stainless, monel and inconel, to fill most heat, pressure and corrosion re-

quirements. It's available in a full range of sizes, complete with any required types of fittings. In addition, Titeflex is all-metal. Regardless of the operation, it is more resistant to fatigue . . . it will stand up longer and give better service.

Write us for catalog outlining Titeflex advantages in full.

Titeflex, Inc.

504 FRELINGHUYSEN AVENUE, NEWARK 5, NEW JERSEY

TITEFLEX FILLS TUBING REQUIREMENTS TO A



Build for today



A modern installation of a Conduit and rigid conduit system in a streamlined metal working plant. Type RSM Junction Conduits provide for easy expansion... branch circuits can be added or removed by connecting to the main conduit.

A
Nationwide
Distribution
Through Electrical
Wholesalers

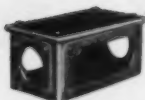


... and tomorrow

A modern **CONDULET** and rigid conduit installation gives you enduring protection

PLUS

the flexibility to meet tomorrow's needs



Type RSM Junction Condulets
RS Series take 4 detachable
hub plates with up to 3 hubs
for conduit from 1/2" to 3 1/2"



Type LFB Obround Condulet



Type LBB Obround Condulet



Type LL Obround Condulet



Type C Obround Condulet



Type U Obround Condulet



Type T Obround Condulet



Type BUF Mogul Condulet
Mogul Series are for use where
larger openings are needed
for pulling large conductors



**Type ARE Arkite
Plug Receptacle**

The most important consideration in an electrical installation is continuous plant operation through the years. Crouse-Hinds sturdy cast Feraloy CONDULETS and rigid conduit provide the best possible mechanical protection against accidental damage to electrical wiring and equipment.... prevent costly shutdowns.

Next in importance is flexibility to meet the needs of today's fast moving industry. A modern CONDULET installation provides for growth and changing conditions. CONDULETS with detachable hub plates make it easy to change circuits or add new ones at any time.

In addition to protection and flexibility, a CONDULET installation gives you these definite advantages:

- **ECONOMY.** The installed cost of Crouse-Hinds CONDULETS and rigid conduit compares favorably with other wiring methods. The added advantages make it the really economical method that pays dividends over the years.
- **SAFETY.** Ground continuity is of vital importance. CONDULETS with taper threaded hubs and rigid conduit with tapered threads make a secure joint that provides a reliable and permanent low resistance path to ground. This safety feature assures maximum protection against personal injury and fire.
- **CORROSION RESISTING.** Cast Feraloy CONDULETS give the best protection wherever moisture, dust, or corrosive atmospheres are present.
- **UNIVERSAL APPLICATION.** You can install galvanized CONDULETS and galvanized rigid conduit under all atmospheric conditions and in all occupancies.
- **QUALITY.** The trademark CONDULET stands for the highest quality, reliability, and long life.
- **VARIETY.** More than 15,000 items are listed in the CONDULET Catalog, including a complete explosion-proof and dust-tight line for use in hazardous locations.

On YOUR next electrical layout, plan to get all the benefits of sturdy cast Feraloy CONDULETS and rigid conduit... the universal wiring method.

CROUSE-HINDS COMPANY Syracuse 1, N. Y.

OFFICES: Albuquerque—Birmingham—Boston—Buffalo—Chicago—Cincinnati—Cleveland
Dallas—Denver—Detroit—Houston—Indianapolis—Kansas City—Los Angeles—Milwaukee
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Crouse-Hinds Company of Canada, Ltd., Toronto, Ont.

** CONDULETS
are made only by
CROUSE-HINDS*

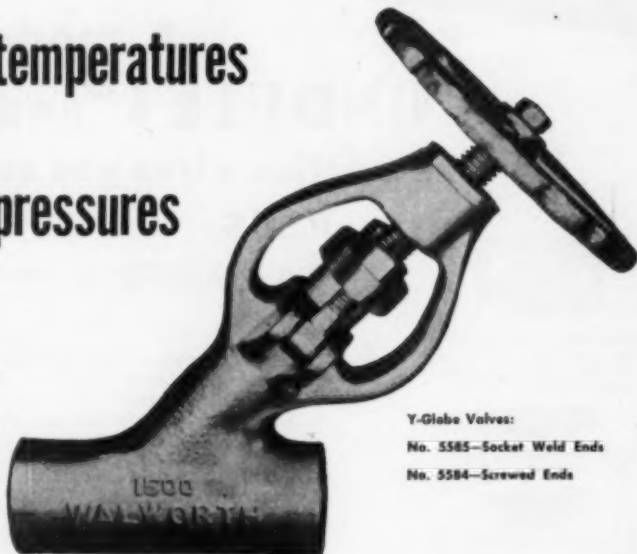
CONDULETS · TRAFFIC SIGNALS · AIRPORT LIGHTING · FLOODLIGHTS

Walworth's NEW small cast steel valves

SERIES 1500 — SIZES $\frac{1}{4}$ to 2 inches

handle } **HIGH** temperatures
 } **HIGH** pressures

Walworth is proud to make these new Small Cast Steel Valves available to power stations . . . oil refineries . . . ships . . . wherever piping is subject to severe pressures and temperatures. Non-shock service ratings of these valves: 1500 psi—950F for steam; 3600 psi—100F for water, oil or gas. Cast of chromium molybdenum steel, they are compact and light, yet exceptionally strong. Both Y-Globe and Angle type valves are available.



Y-Globe Valves:

No. 5585—Socket Weld Ends

No. 5584—Screwed Ends



Angle Valves:

No. 5587—
Socket Weld End

No. 5586—
Screwed End

Simplified Walworth design eliminates many of the valve problems encountered in high pressure service. Among the features of this new valve are:

INTEGRAL BODY AND YOKE — made from a single casting without threading or welding. Bonnet joint — always a potential source of leakage — is eliminated. Valves can be reassembled quickly and easily.

ROTATING DISC — prevents valve seat distortion and consequent leakage. Cuts down replacements.

WELDED SEAT RING — compensates for changes in pressure and temperature—eliminates a major source of leakage.

SPECIAL BACK SEAT BUSHING — permits repacking the valve under pressure with greater safety.

PACKING CHAMBER — designed to dissipate heat thus keeping packing rings at lower temperatures—gives them longer life.

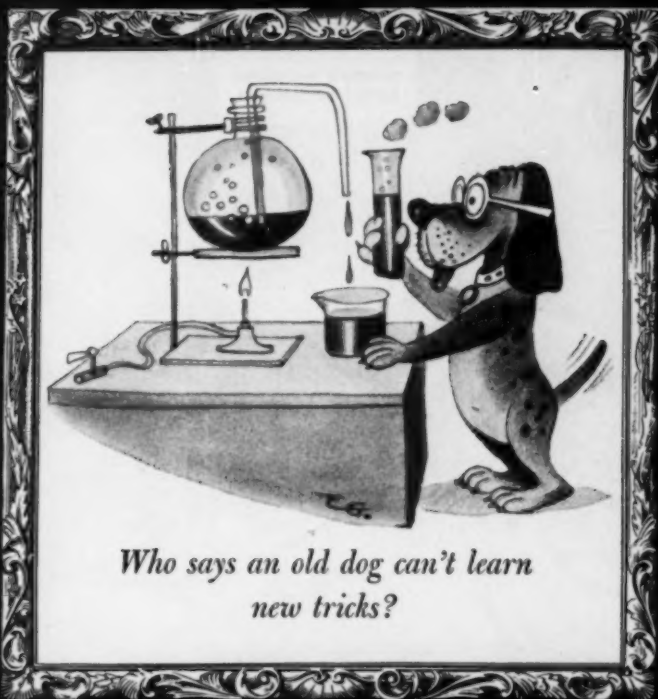
These valves are available with either socket weld ends or screwed ends, in sizes ranging from $\frac{1}{4}$ to 2 inches. For further information on Walworth series 1500 Small Cast Steel Valves, see your local Walworth distributor, or write for Circular No. 134.

WALWORTH

valves • fittings • pipe wrenches

60 EAST 42nd STREET, NEW YORK 17, N. Y.

DISTRIBUTORS IN PRINCIPAL CENTERS THROUGHOUT THE WORLD



*Who says an old dog can't learn
new tricks?*

THERE ARE MANY PROFITABLE NEW USES FOR ION EXCHANGE—BESIDES WATER CONDITIONING

New applications of old principles make it possible for you to recover from solutions many substances which usually are wasted. Permutit's new ion exchange processes turn waste into profit, reduce operating cost, and eliminate many waste disposal problems.

For Instance:

PHOSPHORIC ACID PICKLING. A new process, by reclaiming the acid for further use, makes phosphoric acid pickling no more expensive than sulphuric acid pickling. Corrosion of surroundings is eliminated and a desirable phosphate coating is produced. Iron loss is reduced.

CHROMIC ACID PURIFICATION. Another new process saves up to 90% of the chromic acid used in metal treating applications because Permutit Q removes impurities from the bath solution. No wasteful dumping is necessary. Permutit S prevents waste by saving the chromates in the rinse water, for conversion to free chromic acid.

METAL RECOVERY. An improved process permits economical recovery of a variety of metals, such as copper, zinc, and nickel, from solutions which previously constituted a serious waste disposal problem. A variety of ion exchange techniques permits recovery in a form which is immediately useful, and the disposal of the remaining solution is more easily accomplished.

• These are only a few of the new developments in ion exchange. Permutit has been the sole maker of all types of ion exchange equipment and minerals for 38 years. For further details, write to The Permutit Company, Dept. CE-8, 330 West 42nd Street, New York 18, N. Y., or to Permutit Company of Canada, Ltd., 6975 Jeanne Mance Street, Montreal.

PERMUTIT®



"We've Cleaned Out The Trouble Spots in Bunker Oil Transport Layouts!"

HOW IT WORKS

Fuel from underground storage (A) flows through pipelines (B) heated by safe 20-volt current from Transforming Energizer (C). No coking—heat spreads evenly over entire system. Thermostat (D) controls temperature at 120°F., makes system 100% automatic.

During intermittent shutdowns, fuel temperature is maintained automatically. During seasonal shutdown, fuel can solidify—Thermal Electric will melt out the pipe system.

"We've found the simplest way to eliminate the hazards and trouble-spots in steam pipe heating layouts—just eliminate the steam entirely! Now we engineer maintenance-free bunker oil transport with Thermal Electric.

"Steam or water coils in the storage tank? That bundle of trouble is gone forever! The simple Thermal Electric Tank Unit removes the fuel from unheated storage. Stratification is impossible since the bulk of the fuel stays solid until melted for use.

"What about the snarl of pipes and valves of recirculation? Thermal Electric has scrapped all that too, as the pipes are heated by passing low-voltage electricity through them—independent of boilers and burners.

"Getting rid of this excess baggage gets rid of the excess costs, too. With maintenance costs eliminated and operation fully automatic, the savings quickly pay for the original investment.

"What's more, Thermal Electric's positive *guarantee* lifts the responsibility for perfect performance from the engineer's shoulders. From our experience, we'd say that the best way to clean out the trouble spots from your oil burner layouts is to specify Thermal Electric *Standard Systems!*"

Thermal Electric and Fluid Systems, Inc. are trade marks registered in U.S. Patent Office

PAT. NO. 2,326,408
Thermal Electric

Fluid Systems Inc., 1881 Dixwell Ave., New Haven 14, Conn.

Please send me "The Common Sense of Heavy Fuel Transport" plus Customer List of hundreds of satisfied users.

Name _____ Position _____
Firm _____
Address _____
City _____ State _____



"Tough Fluids Flow Easily For Us with Thermal Electric Pipe Transport!"

"Our first step in engineering industrial fluid transport layouts is to specify Thermal Electric. This method of passing electricity through the same pipe that carries the fluid meets any requirements.

"Temperature is no problem. Thermal Electric will safely move fluids varying from luke-warm chocolate to liquid asphalt at 450°F. Precise automatic controls hold it within 2°F. of the design temperature.

"By using systems in tandem, we cover any distance. This zone-control also nails down the problem of different ambient temperatures. Fluids flow from cold outdoors to warm indoors with no temperature change.

"We design single discharge lines with no return loops and effect tremendous savings in critical materials and capital investment. With all-elec-

tric operation cutting maintenance practically to zero, the savings often pay for the original investment in less than a year!

"If pipe transport of heated fluids is among your projects, it would pay you to get the whole story of Thermal Electric Industrial Systems."

Fluid Systems, Inc. are specialty engineers in the handling of industrial viscous fluids. We are available as special aides to consulting or staff engineers in designing transport systems for any fluid.

YEARS OF PERFORMANCE

American Hard Rubber Co.
Asphalt: 182° at 450°F.

Duff Baking Mix Division
American Home Foods, Inc.
Molasses: 970° at 140°F.

Congoleum-Nairn, Inc.
Emulsion Paint: 337° at 100°F.

General Mills, Inc.
Corn Syrup: 223° at 110°F.

Individual Drinking Cup Co.
Paraffin: 1,409° at 170°F.

Monsanto Chemical Company
Water: 743° at 70°F.

Thermal Electric

Fluid Systems Inc., 1981 Dixwell Ave., New Haven 14, Conn.

Please send me "Simplified Industrial Fluid Transport Cuts Costs" plus customer list.

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Firm _____

Address _____

City _____ State _____

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Need a lower cost solvent
with proven performance?

INVESTIGATE

CELANESE* SOLVENT 601

Celanese Solvent 601 is available in increased volume. It is the lowest cost solvent in its class. It offers improved quality and substantial savings in the production of varnishes, lacquers and other nitrocellulose compositions. Celanese Solvent 601 has been extensively used in formulation to replace methyl ethyl ketone, ethyl acetate, isopropyl acetate, and similar compounds. If you would like to evaluate Solvent 601, in your own products, write for sample quantity. Celanese Corporation of America, Chemical Division, Dept. 503-H, 180 Madison Avenue, New York 16, N. Y.



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Use Traylor Table Feeders in Tandem to maintain accurate proportions when feeding several materials to a single mill



Traylor Table Feeders will help you obtain the product uniformity that is becoming more and more important in all grinding operations. Traylor Table Feeders are built in a wide range of sizes to meet every requirement. For complete details mail coupon today.

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Rotary Kilns, Coolers and Dryers • Grinding Mills
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I am interested in obtaining greater product uniformity from my present mills.

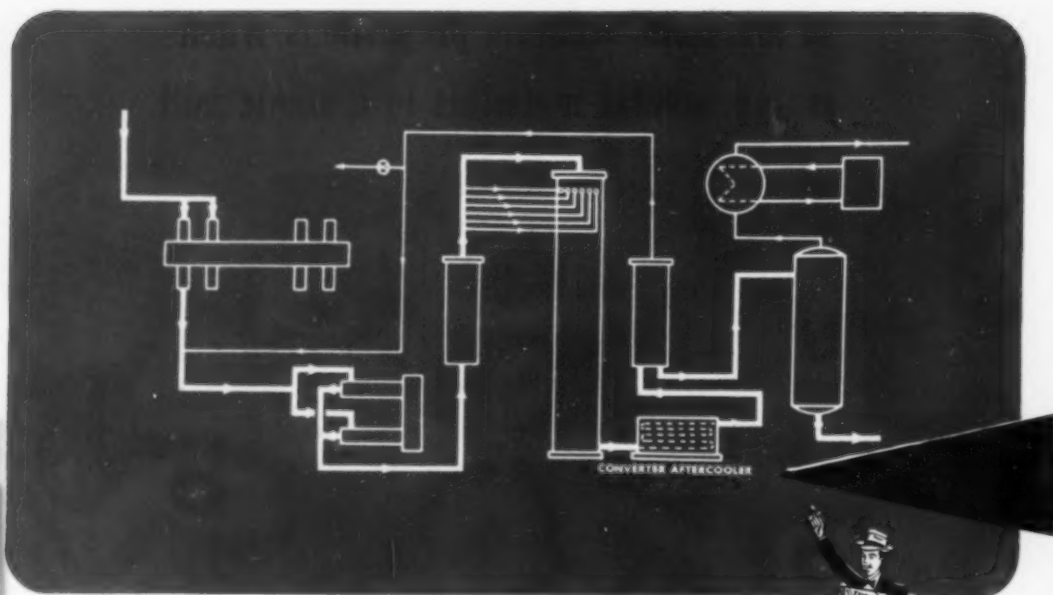
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SALES OFFICES: New York, N.Y.; Chicago, Ill.; Los Angeles, Calif.
CANADIAN MPFRS: Canadian Vickers, Ltd., Montreal, P.Q.

A "TRAYLOR" LEADS TO GREATER PROFITS



Flow chart of Synthetic Methanol Production, gas synthesis section.



Chloride solutions cause *pitting-corrosion* of stainless steel. Stresses on the material — whether those of construction or high-pressure operation — become localized at the root of the pits. Such stresses may reach sufficient local magnitude to cause stress-corrosion and, eventually, failure.

In this case B&W Croloy 5 tubing was found to have superior resistance to initial pitting and consequently to the whole series of previous troubles.

Whatever the analysis needed, whether stainless grades, intermediate chrome alloys, or carbon steel, "Mr. Tubes" — your B&W Tube Co. representative — can help you solve your problems of tubing selection from B&W's complete range of types, sizes, grades, and finishes. Send for Technical Bulletin 6-E, Properties of Carbon and Alloy Seamless Steel Tubing for High-Temperature and High-Pressure Service.

THE BABCOCK & WILCOX TUBE COMPANY

Executive Offices: Beaver Falls, Pa.

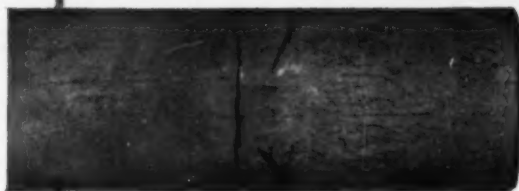
General Offices and Plants

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Alliance, Ohio—Welded Carbon Steel Tubing

Sales Offices: Beaver Falls, Pa. • Boston 16, Mass. • Chicago 3, Ill. • Cleveland 14, Ohio • Denver 1, Colo.
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St. Louis 1, Mo. • San Francisco 3, Calif. • Syracuse 2, N. Y. • Toronto, Ontario • Tulsa 2, Okla.

let's take a
closer look at

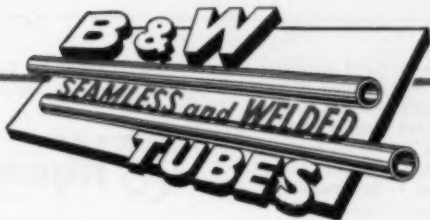
STRESS CORROSION



Here's what happened to Stainless tubing (TYPE 347) when exposed to chloride-bearing bayou water while conveying methanol and unreacted synthesis gases at 300 F and 5000 psi. Note trans-granular branching cracks typical of stress-corrosion in pitted stainless steel.



Here's Croloy 5 tubing, after twelve months in the same service. Note absence of pitting and stress-corrosion. Wall thickness was not appreciably reduced.



TA-1629 S

A Bedtime Story for Very Junior Chemists



Once upon a time, there lived a sad little Sodium CarboxyMethylCellulose. He worked very hard extending Soaps and improving Synthetics. But all the Soaps called him a "war baby." And he wasn't allowed to associate with any but Low Grade Synthetic Detergents.



So he ran away. And arrived one day on the Doorstep of a Corporation in Wyandotte, Michigan. The Corporation picked him up and handed him over to the Research and Development Division. Well, you should see what they did for this little "war baby"!



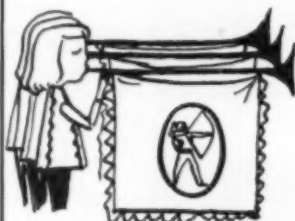
They changed his length and Molecular Structure. They Manufactured him by a brand new Process. They let him associate with High Grade Synthetic Detergents. And then they gave him a name . . . "Carbose*." *Reg. U. S. Pat. Off.



Carbose might have been very happy—but the Soaps still put on airs. "No matter how hard you and those Synthetics try," the Soaps told him, "nothing cleans as well as Soap."



But he worked hard just the same. He practiced Soil Removing and Whiteness Retaining and all the other things a detergency promoter should. And one great day, the Research and Development Division called the Soaps and Synthetics together and read a Proclamation:



"Synthetic Detergent products can be formulated with Carbose which will yield detergency equal to that of High Grade Soaps under conditions favorable to Soap, and far superior to High Grade Soaps under conditions unfavorable to Soap."



"Carbose!" Why, they were talking about him! Carbose was a hero! Yes, it was a great triumph for him . . . but Carbose went on . . . had a large family and did many more things . . . in textiles, paper, paints, ceramics, petroleum . . . and even in soap!

Soda Ash • Caustic Soda • Bicarbonate of Soda • Calcium Carbonate • Calcium Chloride • Chlorine • Hydrogen • Dry Ice Synthetic Detergents • Glycols • Carbose (Sodium CMC) • Ethylene Dichloride Propylene Dichloride • Aromatic Sulfonic Acid Derivatives • Other Organic and Inorganic Chemicals

WYANDOTTE CHEMICALS CORPORATION
Wyandotte, Michigan Offices in Principal Cities



So if you are looking for a chemical with applications involving viscosity regulation, colloid stabilization, surface finishing, or detergency, why not write to us about Carbose?

Pfizer

General Contractors W. J. BARNEY CORP.
Piping Contractors J. H. MERRITT CO.



Where a Name is built on Quality,
look for a plant equipped with
JENKINS VALVES

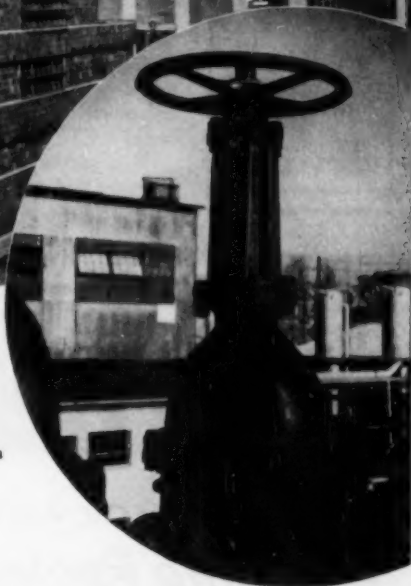
Manufacturing chemists for 102 years, Chas. Pfizer & Co., Inc., is still pioneering in the field of fermentation chemistry and bio-chemical synthesis. For the first time in history, a stable form of Crystalline Vitamin A is now being produced by synthesis on a commercial scale at Pfizer's new \$2,000,000 plant at Groton, Conn.

Here Pfizer, proud of its reputation for quality, has installed the most modern, dependable operating equipment. For in the continuous process manufacture of fine chemicals or antibiotics, equipment must perform with unflinching efficiency. That is why throughout the intricate network of pipelines in this newest Pfizer plant you will find Jenkins Valves.

Jenkins Valves have been the choice, consistently, of leading architects, engineers and contractors for the nation's most progressive buildings—the industrial plants and other structures *advanced* not only in design, but in operating efficiency and economy.

For Jenkins builds *extra* endurance into valves—proved by low upkeep cost records in every type of service. Yet, despite this extra value, *you pay no more* for Jenkins Valves. For new installations, for all replacements, let the Jenkins Diamond be your guide to lasting valve economy. Jenkins Bros., 100 Park Ave., New York 17. Jenkins Bros., Ltd., Montreal.

SOLD THROUGH LEADING INDUSTRIAL DISTRIBUTORS EVERYWHERE



At Pfizer's Groton plant Jenkins Bronze, Iron, Cast Steel and Stainless Steel Valves are installed for all types of service, including water, steam, fire-fighting, refrigerant, and processing lines.

JENKINS VALVES

LOOK FOR THE DIAMOND MARK



Jenkins Bros.

WHEN YOU LOOK TO TOMORROW... *today!*

Tomorrow's performance of the pumps you select *today* is an important first consideration! Will they be efficient for years... will they be easy and economical to service and maintain? These are the questions that should guide today's pump buyer.



Water lubricated, external sleeve bearing assemblies assure maximum life for bearing assemblies without sacrifice of line shaft streamlining or bow efficiencies.

In Fairbanks-Morse Pumps, you can be sure of these important advantages. Take the Fairbanks-Morse Pomona Vertical Deepwell Turbine Pump, for example. A new, water-lubricated external sleeve bearing assembly assures longer life wearing surfaces... minimum friction and shaft bearing losses... simple, easy replacement of worn sleeves.

This new feature and the many other Pomona advantages are your assurance that the pump you buy today will be efficient and economical tomorrow... and for years to come.

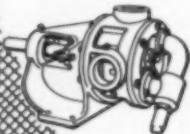
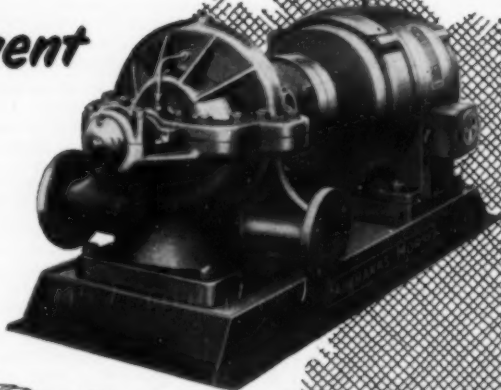


FAIRBANKS

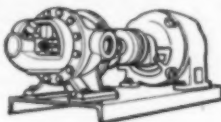
A NAME WORTH

AND, FOR ANY *Pumping Requirement*

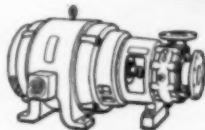
... you'll find a dependable, efficient Fairbanks-Morse Pump that will give you a new conception of low-cost pumping. Whether you need a centrifugal... a rotary... sewage or trash pump... turbine... vertical or horizontal angle-flow, you'll find the size and capacity you want in the Fairbanks-Morse line. This completeness of line is an important advantage to you... you can simplify your ordering... your parts and service... your inventory by standardizing on a single source, Fairbanks-Morse.



Rotary pumps



Westco Turbine pumps



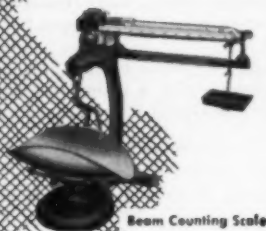
Built-together centrifugal pumps

Horizontally split case
centrifugal pump

YOU CAN *Count* ON THIS SCALE . . .

You can count small parts or pieces, with Fairbanks-Morse Counting Scales easily and accurately *by weight*! They save time . . . save money . . . eliminate errors. Whether you manufacture or buy small parts in quantity, these accurate counting scales are one of your biggest aids in inventory control, in estimating cost work and in determining the volume of piecework.

With the *exact* counts you get, you eliminate the possible loss of customer good will over "short count" shipments . . . assure better labor relations through accurate piecework records and less fatiguing inventory work. You'll find it pays to "count on" a Fairbanks-Morse Counting Scale.



Beam Counting Scale



Dial Counting Scale

MORSE

REMEMBERING

AND, TO SPEED AND SIMPLIFY *Industrial Weighing*

. . . you'll find the complete line of Fairbanks-Morse Scales your best answer. These accurate weighing instruments make reading easy . . . minimize the chance for human error. Designed for sustained accuracy, these dependable weighing instruments cut the costly little weighing errors that can mount up to so much lost profit. Your Fairbanks-Morse weighing expert will be happy to check your weighing operations with an eye to elimination of costly errors and faster weighing operations.



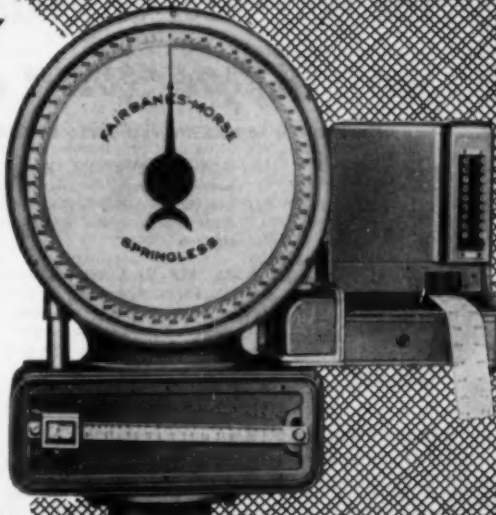
Full Capacity Beam Scale



Bench Dial Scale



Portable Dial scale



Printomatic Dial Scale

..YOU WANT THIS ROTOR DESIGN...

It's Copperspun!



If you buy or use motors, chances are that most of them are of the polyphase squirrel cage type—the most widely used class of integral horsepower motors made—for sustained heavy-duty drives in almost every class of service.

In rotor design, such service separates the good from the poor—and highlights your need for Fairbanks-Morse motors with Copperspun rotors, made through an exclusive centrifugal casting procedure developed by Fairbanks-Morse.

For in Copperspun rotors, you get the benefits of superior electrical characteristics—plus a design that is mechanically stronger for withstanding the most severe working conditions.

FAIRBANKS

A NAME WORTH

FOR POLYPHASE SQUIRREL-CAGE MOTORS

with *Copperspun Rotors!*

Here are a few in the complete Fairbanks-Morse line

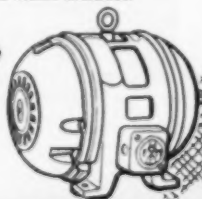
GENERAL PURPOSE, drip-proof motors mountable in any position with full protection against flying chips, falling particles, dripping liquids, etc.

AXIAL AIR-GAP MOTORS:

Averaging 30% lighter and 40% shorter overall—with flywheel effect three times that of corresponding ratings of conventional motors. Add to appearance, decrease size and weight of any driven machine. Meet all AIEE and NEMA standards.

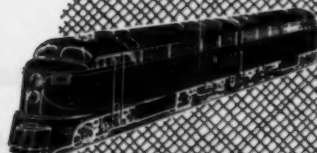
TOTALLY ENCLOSED FAN-COOLED motors operate econom-

ically, safely under adverse conditions, including corrosive gas, vapors, steam or where metallic particles, abrasive dust and/or other materials are in the air. Available with Underwriters labels for use in Class 2, Group G hazardous locations.



Why Our Best Customer is Hard to Satisfy

Perhaps the "best customer" for Fairbanks-Morse products is Fairbanks-Morse itself—for all Fairbanks-Morse products are components of and/or used in the manufacture of all other Fairbanks-Morse products. Fairbanks-Morse diesel locomotives, for instance, prove up the design advantages of Fairbanks-Morse Opposed-Piston diesel engines, electrical equipment and pumps—all of which have broad preference in many separate and specific industries. Fairbanks-Morse pumps are driven by Fairbanks-Morse motors . . . Fairbanks-Morse raw materials are weighed through manufacture by Fairbanks-Morse scales . . . a continuing close interrelationship between research, design, manufacture and use that results in products that are designed and built from your standpoint . . . that assures your good judgment in buying from Fairbanks, Morse & Co., Chicago 5, Ill.



Diesel Locomotives: For yard, switcher, transfer, suburban, freight and high-speed passenger service.



Diesel Engines: for all size stationary and marine service, including dual fuel applications.



Scales: For every weighing operation including truck scales, railroad track scales, dial beam, belt conveyor, counting, and Printomatic scales.



Pumps: Vertical, deep well, centrifugal and rotary pumps of all sizes, also specialized pumps for the widest range of applications.



Home Equipment: Lighting plants, home water systems, water softeners, lawnmowers, etc.



Electric Motors: Complete range of size and type to insure unbiased recommendation in correct motor application.

MORSE

REMEMBERING



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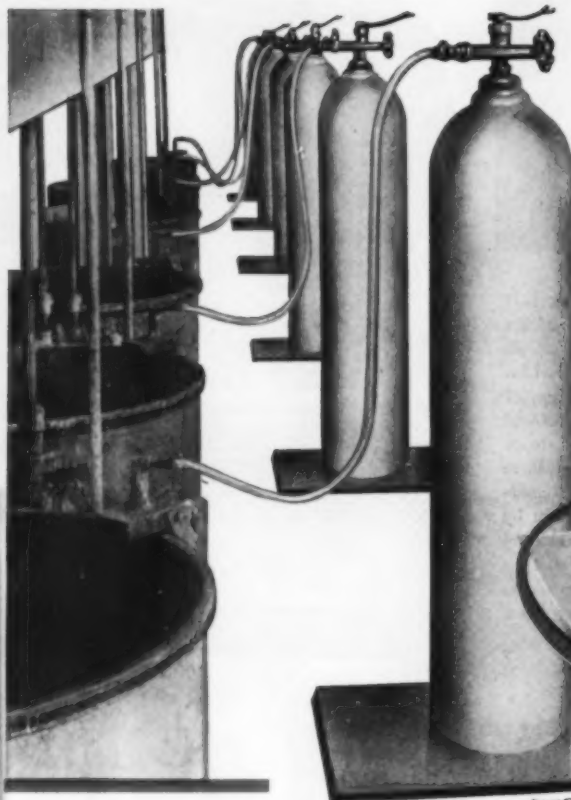
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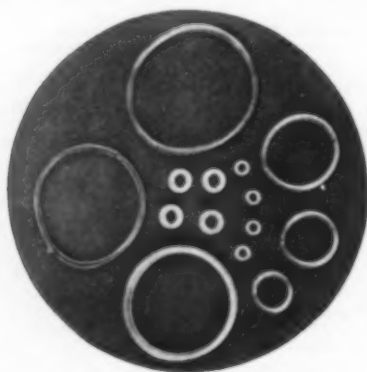
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TYGON TUBING as used by the Eagle-Picher Co. to convey chlorine gas from cylinders to tanks containing metallic oxides—a truly severe test of chemical resistance.

To **CONDUCT CORROSIVE CHEMICALS**

TYGON
flexible plastic
TUBING



TYGON extrusions (tubing, channel and solid cord) are also highly effective as chemically resistant gasketing in all types of process equipment requiring positive and enduring seals.

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Why not solve the gas or liquid transmission problems in your plant by writing, today, for detailed information and technical data on TYGON TUBING? Ask for free Bulletin T-77. Address: U. S. STONEWARE, TALLMADGE SQUARE, AKRON 9, OHIO.

THE *Chemmentator*

Reg. U. S. Pat. Off.

Prepared under the editorial direction of Joseph A. O'Connor, News Editor

Low-cost titanium at last?

A new process is expected to cut the cost of producing titanium metal from the present \$5 per pound of sponge to \$1 or less, according to the Navy. The process, developed by Eugene Wainer in the Cleveland, Ohio, laboratory of Horizons, Inc., has reached the pilot-plant stage, the Navy says. Wainer was formerly with Titanium Alloys Manufacturing Co., now a division of National Lead.

Horizons, Inc., and Ferro Corp. have teamed up to form Horizons Titanium Corp., which will build a pilot plant in Cleveland to produce titanium by the new process.

Successful commercial production of titanium at such a low price would lead to its widespread use by industry and the military.

Meantime, Monsanto and National Research Corp. have joined forces to push research at Monsanto's central research laboratory in Dayton, Ohio, on improved processes for production of titanium metal.

How Wilson sizes up the sulphur situation

NO LET UP—Defense Mobilizer Charles E. Wilson takes issue with government spokesmen who foresee an end to the sulphur shortage by 1953. Requirements are expected to increase faster during the next two years, he says, than new supplies can be obtained.

IMPACT—Shortages will be felt, Wilson reports, in the production of fertilizers, petroleum, paints, aluminum, paper and many chemicals. And foreign countries will get less low-priced sulphur from the U. S.

DEMAND MOUNTS—During 1950, supplies did not quite keep pace with demand, and inventories were lowered. In 1951, the slight increase in production from limited high-grade deposits in the U. S. has failed to meet growing requirements of the defense mobilization program and of the civilian economy.

ESTIMATES FOR 1953—Total sulphur requirements for 1953 will come to 7.22 million long tons, according to Wilson's planners. Sulphuric acid production will take 4.43 million tons of that total. Of the 4.43 million tons of sulphur going into acid, 1.8 million will be for fertilizers, 0.55 million for petroleum, 0.87 million for chemicals, and 1.21 million for metallurgy, paint, rayon and other uses. Pulp manufacturing will require 0.52 million tons of sulphur, other chemicals will take 0.82 million, and 1.45 million tons will be for export.

SOURCES—Prospective supply from present sources will furnish only 5.99 million tons. Additional supply must be derived from native sulphur, recovered sulphur and pyrites.

Defense Minerals Administration has set an expansion target of about 1 million long tons of added output by the end of 1953. Expansion projects already under consideration will account for over 700,000 tons, or about 12 percent more than the 1950 U. S. output.

The program calls for exploratory drilling, recovery plants, stepped-up foreign production, and "hot water" mining. New sources of sulphur other than Gulf Coast brimstone will have to be exploited. To decrease demand, conservation programs and the substitution of other acids for sulphuric must be pressed.

Calcium: substitute for critical metals

Metallic calcium, about 99 percent pure, will be produced by New England Lime Co., Canaan, Conn., for the government. New and important uses for metallic calcium are gradually being uncovered.

For one thing, it's replacing critical metals. A new long-life storage battery, recently put into commercial use by Bell Telephone Laboratories, uses 0.5 percent calcium instead of 12 percent antimony, now scarce.

During World War II about 500,000 lb. of metallic calcium was produced and converted into calcium hydride, which reacts with water to give calcium hydroxide and hydrogen. This hydrogen was used by the government to inflate weather balloons. The metallic calcium to be produced by New England Lime is expected to be used for this purpose.

Another company to produce metallic calcium is White Metal Rolling & Stamping Co., Brooklyn, N. Y. As during World War II, it will roll and extrude metallic calcium into sheets and other forms on a more or less experimental basis.

Petrochemicals: the cresting wave

Making chemicals from petroleum and natural gas, a Johnny-come-lately among U. S. industries but already one of the most important, is growing so fast that 14 billion pounds of products were manufactured in 1950—double the output in 1947.

Petrochemicals offer raw materials in volume for
(Continued)

THE CHEMENTATOR, continued

the manufacture of many products. Here are some eye-bugging facts dished up by Jersey Standard:

More than half a million compounds could now be synthesized from petroleum if there were uses for all of them.

A billion-dollar synthetic rubber industry, built in two years during World War II, was founded on the polymerization of petroleum fractions or derivatives.

About 20 percent of all detergents made in the U. S. last year were synthetic soaps; they are a bigger proportion now.

About 70 percent of industrial alcohols, used for solvents and as bases for many organic chemicals, are synthetic.

40 percent of the sales of major chemical companies in 1949 were of products that hadn't even been developed in 1935.

More than half of the nation's organic chemicals are derived from petroleum and natural gas.

Despite the tremendous number of products made from petroleum and natural gas, such production last year required less than 0.5 percent by weight of the nation's oil and natural gas production. During the next half century, the influence of the petrochemical industry on America's way of living, and possibly on the nation's very survival, promises to be immense.

National Distillers into petrochemicals

National Petro-Chemical Corp., a combination of National Distillers and Panhandle Eastern Pipe Line Co., is dickering for a site for a petrochemical plant in Illinois. One spot under consideration: a 500-acre tract near Tuscola on the Illinois Central right of way.

What's proposed is a \$38 million plant to strip natural gas of Ethane, as well as propane and butane. The Panhandle pipeline carries 400 million cubic feet of gas daily, from which a small percentage of hydrocarbons would be stripped. Total output of this proposed petrochemical plant would fill 60 tank cars daily. This marks the entry of National Distillers into the petrochemical field.

Indiana Standard to make iso-octyl alcohol

At its Wood River, Ill., refinery, Indiana Standard will put up an iso-octyl alcohol plant to produce 10 million pounds per year. It should be completed before the end of 1952.

Iso-octyl alcohol is used in the manufacture of additives for the production of heavy-duty motor oils. These are in high demand for military and essential civilian uses.

Another big use for iso-octyl alcohol is in the

manufacture of plasticizers for vinyl resins. These resins go into electrical insulation, molded parts of electronic equipment, protective packaging and textile coatings.

More soda ash capacity

Solvay Process Division of Allied will spend \$13 million to expand soda ash capacity at its Baton Rouge, La., plant. Output of ash will be upped one-third. The plant will be completed in about two years.

Big boost in phthalic anhydride

Despite current record production, phthalic anhydride continues short. To boost output, Allied's Barrett Division plans an expansion on top of an expansion.

If Barrett gets a certificate of necessity from the government, it will build a plant at Philadelphia, Pa., to turn out 36 million pounds of phthalic acid. It will cost about \$3.5 million, take a year and a half to build.

This comes in the wake of an expansion that Barrett already has under way in Chicago, Ill., where a plant is being built to produce 30 million pounds a year of phthalic anhydride. Barrett also makes phthalic at its present Ironton, Ohio, and Philadelphia plants.

A highly important chemical in the defense program, phthalic anhydride goes into alkyd resins that are used in coatings for tanks, guns, battleships, ration cans, trucks, shells and jeeps. Plasticizers made from phthalic anhydride go into the manufacture of smokeless powder, waterproof clothing, protective coverings, fabrics and other products.

Solvay installing mercury cell unit

Allied's Solvay Process Division will spend about \$10 million for the construction of a new mercury cell chlorine-caustic unit at its Syracuse, N. Y., plant. This will about double Solvay's electrolytic chlorine capacity at Syracuse. It will take 18 months to two years to complete the project.

At Solvay's Baton Rouge, La., and Huntsville, Ala., plants, chlorine and caustic are also produced by electrolysis of salt brine. But at its Hopewell, Va., plant, Solvay uses salt and nitric acid as raw materials with sodium nitrate as a co-product and nitrosyl chloride as a byproduct.

Just recently Solvay decided to try a new wrinkle at Hopewell: the nitrosyl chloride byproduct from the present chlorine plant will be reacted with oxygen to produce chlorine and nitrogen tetroxide. The tetroxide will be used to make additional nitric acid.

Commercial debut for wollastonite?

Godfrey L. Cabot Co. is apparently eyeing the possibilities of wollastonite, a native calcium silicate mineral. Cabot has taken a financial interest in Wills-

(Continued)



Another LIQUID HAULING PROBLEM with FRUEHAUF TANK-TRAILERS



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MANILA

I-T-E Mechanical Rectifier to Provide D-C Power for Philippine Chlorine Production



Otto Jensen (right), manager of the Rectifier Division, I-T-E Circuit Breaker Company, Philadelphia, explains cathode ray oscilloscope reading of contact timing on new mechanical rectifier installation for the Superior Gas and Equipment Company, Manila, Philippine Islands. Observing the demonstration are (left to right) D. Tiosejo, Vice President of the Philippine company; H. G. Noordberg, Vice President; and B. D. Van Eyck, Industrial Equipment Manager, Philips Export Corporation of New York.

PHILADELPHIA: A step toward making the Philippines independent of outside chlorine supplies was taken recently when the first I-T-E Mechanical Rectifier manufactured for export was shipped to Manila from the Port of Philadelphia.

The rectifier will be put into operation this fall in a new \$700,000 chlorine plant near Manila. The plant will produce an estimated six tons of chlorine daily for water chlorination, bleaching, and civil defense purposes.

Designed to produce an uninterrupted source of d-c power for plant operation,

the rectifying equipment has a rating of 12,000 amperes at 65 volts.

The rectifier was purchased through Philips Export Corporation, New York City, by the Superior Gas and Equipment Company, Manila, whose Chief Engineer and Director, M. I. Felizardo, and Vice President, D. Tiosejo, supervised acceptance tests at the I-T-E Philadelphia plant.

Deciding factors in Superior's selection of rectifying equipment were the mechanical rectifier's high inherent efficiency (96.6%), the small space requirement, low maintenance cost, and ease of operation.

I-T-E Mechanical Rectifiers are available in units rated from 4,000 to 10,000 amperes, in any voltage from 50 to 400 volts d-c. Primary voltages, 2,300 to 22,000, three-phase a-c.

I-T-E Bulletin 5106 contains complete technical information on the Mechanical Rectifier, including a detailed presentation of operating principles. Send for it today. I-T-E Circuit Breaker Company, 19th and Hamilton Streets, Philadelphia 30, Pa.

The  *Company*

THE CHEMENTATOR, continued

boro Mining Co. of Willsboro, N. Y., in exchange for a preferred ownership position.

What's needed to prove the worth of wollastonite is an efficient semi-commercial plant that could make carload shipments.

Wollastonite has possible uses in the ceramic industry and in the paint, paper and plastics industries. By treating it chemically, many interesting products can be made. For example, it might replace steatite in low-loss insulators. Rutgers University has been doing work on this for the Signal Corps and results look promising. If wollastonite becomes commercial, Cabot will be in a nice position.

New process for dyeing glass fibers

A new way has at last been found to dye glass fibers without impairing their flame resistance. At the same time, their fastness to washing and their abrasion resistance, as well as their all important draping qualities, are improved. It took three companies to turn the trick. The three: General Dyestuff, General Aniline & Film and Owens-Corning Fiberglas.

Glass fibers have no affinity for ordinary dyestuffs. And when resin binders are used with pigment colors the binders have the big disadvantage of not being completely flame resistant. Moreover, treated fabrics are stiff and won't drape easily.

Now, however, the problem of dyeing glass fibers has been solved. Owens-Corning first came up with a new heat cleaning process that takes but a few seconds at high temperature to burn off the sizing, make the fiber soft and pliable, and set the crimp.

Next, General Aniline, with the cooperation of Owens-Corning and General Dyestuff, imparted an affinity for vat pigments to glass piece goods by the cross-linking of methyl vinyl ether-maleic anhydride copolymer with polyvinyl alcohol. (This also acts as a binder for Teflon.) Owens-Corning is now producing for evaluation Fiberglas dyed by this method.

Successful dyeing of glass fibers will give a big boost to an already skyrocketing industry. Owens-Corning, for example, biggest of about a dozen manufacturers, has six plants and its sales are expected to top \$100 million this year.

Home sweet home in the atomic age

Better housing for workers at atomic energy plants is sought by the United Gas, Coke & Chemical Workers, CIO. Adequate housing at Oak Ridge, Tenn., Los Alamos, N. M., and Richland, Wash., will be a major union demand in all future negotiations with AEC and its subcontractors.

The union's executive board, meeting recently in Washington, authorized President Martin Wagner of the Chemical Workers to organize a housing committee, with representatives from every atomic energy

installation in the United States. The committee will seek to eliminate "slum conditions" at existing AEC plants and to forestall a repetition of housing problems in new communities being set up by AEC.

The board also voted to ask for a congressional hearing to "expose the details of present slum housing at the AEC plants."

Demand for process instruments soars

Demand for scientific apparatus and process instruments for basic defense industries is running 250 to 300 percent above pre-Korean levels, reports President Henry F. Dever of Brown Instruments.

The manufacture of process instruments is not large either in dollar volume or in requirements for essential materials. But, as Dever points out, "the 15 or 20 companies that specialize in these devices provide the catalyst that speeds output in vital industries such as heavy chemicals, metal producing and processing, petroleum, rubber, plastics, pipelines, textiles and atomic energy. At our level of control apparatus the business does not run more than \$60 million to \$100 million annually, but when we are talking about finished products we are talking about \$25 billions or more of goods essential to the war effort."

Dever attributes the unusual increased demand for process instruments to recognition of those devices as the fastest method for expanding industrial production without necessarily adding to plant facilities.

As one part of its program to meet these increased demands, Brown Instruments is letting subcontracts. "We have subcontracted for about \$100,000 in parts," says Dever. "An equal amount will represent the tooling done for us. To supplement our own manufacturing, we estimate that these contracts will amount to 10,000 to 15,000 machine hours a month for production, a total to the end of the year of 15,000 to 20,000 man hours for tooling. While this is substantial it represents but a small part of our own production. The work we need is for defense projects." Brown Instruments expects to subcontract even more of its work after bids are screened.

Aromatics chromatography to the rescue

NEW PROCESS—Petroleum is the big new source of aromatics, now urgently needed for defense. But separating aromatics made from petroleum is a costly and difficult job. Now comes Sun Oil Co. with a brand new process for doing just that. It's the Arosorb process, and it separates aromatics by selective adsorption from the liquid phase, using silica gel.

FIRST BIG UNIT—Pioneer Arosorber will be part of the new \$8 million plant to be built at Sun's Marcus Hook, Pa., refinery. It will be teamed with a Houdriformer. This catalytic reformer, developed by Houdry Process Corp., will convert 10,000 bbl. a

(Continued)



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THE CHEMENTATOR, continued

day of naphthenes into aromatics, which will be separated in the Arosorber.

MORE AROMATICS—The Marcus Hook plant will produce 15 million gallons of xylenes, 30 million gallons of toluene and 13 million gallons of benzene per year. That's enough benzene alone to provide almost one-eighth of the government's requirements of over 100 million gallons per year. This benzene quota must be met from petroleum sources; it's over and above that now coming from coal.

Benzene is needed for the production of synthetic rubber, plastics, resins, detergents and other chemicals required by the military and for essential civilian uses. Toluene is vital for the manufacture of TNT, and both toluene and xylenes are needed for aviation gasoline.

SELECTIVE ADSORPTION—Chromatography takes advantage of differences in their adsorption coefficients to separate liquids. First they're selectively adsorbed, then they're desorbed. Up to now, chromatography has been used in biochemical work on such costly products as amino acids, vitamins and antibiotics. Merck, for example, uses chromatographic adsorption on alumina to produce highly active streptomycin. But its possibilities for getting pure aromatics from petroleum sources have been forecast (see *Chem. Eng.*, Nov. 1948, p. 133). Sun's new Arosorber will be the first for the separation of the comparatively low-cost aromatic hydrocarbons by liquid-phase adsorption.

ADSORBENT BEDS—The new plant will have six adsorbent cases, each 10 ft. in diameter and about 20 ft. high. They will contain a total of about 500,000 lb. of a special silica gel made by Davison Chemical Corp. Highly porous, this silica gel has a surface area for adsorption of about 90 acres per pound. Hence it can separate large quantities of aromatics. The gel will be protected from moisture and other poisons by pretreatment in regenerative dryers. Pilot-plant work points to a gel life of one year. Each silica gel case will go through 15 cycles per day or one about every 100 min. This cyclic operation will be automatically controlled, principally by the measurement of the refractive index of the effluent from each case. Cycles will be staggered, thus making possible virtually continuous operation of the rest of the plant.

HOW PROCESS WORKS—Distillation of the exit stream from the Houdriformer will produce an aromatic-rich feed for the Arosorber. In the process, this feed passes through a bed of silica gel, which adsorbs the aromatics. When the bed is nearly saturated, the feed is shut off and the gel bed desorbed. First, butane washes out saturates left from the charge stock. Then a stream of mixed xylenes frees the aromatics from the gel, after which the cycle is repeated.

These desorbents are recovered from both the

saturate effluent and the aromatic effluent by fractional distillation and recycled. Xylenes, of course, are also one of the products. Another distillation separates benzene and toluene.

For a feed containing 35 percent aromatics, it will take for desorption about 2 bbl. of mixed xylenes and 0.5 bbl. of butane per barrel of charge.

YIELDS—A recovery of 90 percent yields 98 percent pure aromatics. At 90 percent purity, recovery is jacked up to 98 percent. A light sulphuric acid wash is all that's required to make specification benzene and toluene. And it doesn't take much acid, since olefins aren't appreciably adsorbed.

COSTS—With allowances for overhead, taxes, maintenance and depreciation in 10 yr., it's estimated that an Arosorber unit turning out 1,000 bbl. per day of aromatics at an operating cost of 6.5 c. per gal. of aromatics would require an investment of \$1.2 million. A 2,000-bbl. unit could produce aromatics at an operating cost of 5 c. per gal. and would call for an outlay of \$1.9 million. Both Houdry and Universal Oil Products Co. will license the Arosorb process under Sun patent rights.

SIGNIFICANCE—Chemical industry will keep its eyes peeled to see whether liquid-phase adsorption is the best route yet to higher output of aromatics. Moreover, the process is highly flexible, can be used to recover DDT solvents, other solvents, improved furnace and diesel oils. In fact, it's not limited to the petroleum industry, but can be used by the process industries to separate many chemicals otherwise difficult to recover or purify.

Hydroforming with fluid catalysts

Fluid Hydroforming, jointly developed by Standard Oil Development Co., Indiana Standard and M. W. Kellogg Co., is fast catching on with refiners. Pan-American Southern Corp. has ordered a 2,000-bbl.-per-day unit for its Destrehan, La., refinery, and Cities Service has ordered a 10,000-bbl.-per-day unit for its East Chicago, Ill., refinery and a 20,000-bbl.-per-day one for its Lake Charles, La., installation. Kellogg is hard at work on these jobs.

Catalyst is maintained in a fluidized bed in the reactor and vaporized naphtha passed through the bed. Cyclones at the top of the reactor remove entrained catalyst from the reformed hydrocarbon vapor, which is condensed and then distilled. After regeneration the catalyst is recycled to reform more naphtha.

Product is high in aromatics and could be the feed for a benzene production plant. Bottoms from the main fractionating tower just after the reactor are extremely high in naphthalene.

Kellogg estimates that daily operating costs of the new Fluid Hydroforming process will be 30 percent lower than for present fixed bed hydroformers. Initial cost will be one-third less. Moreover, yields will be 3 to 5 percent higher. —End

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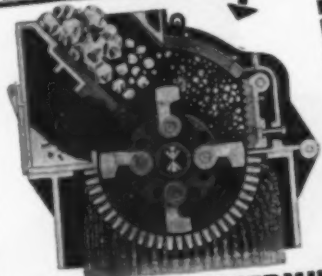
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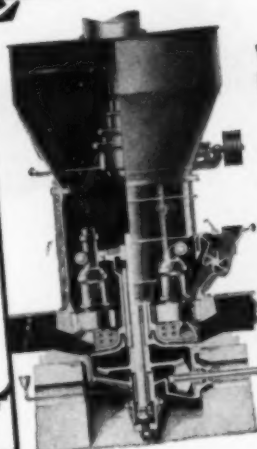
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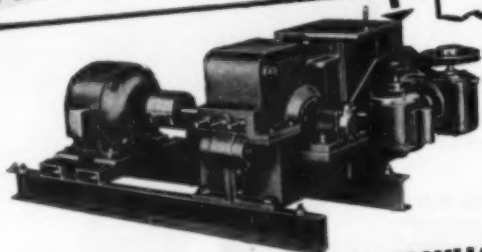


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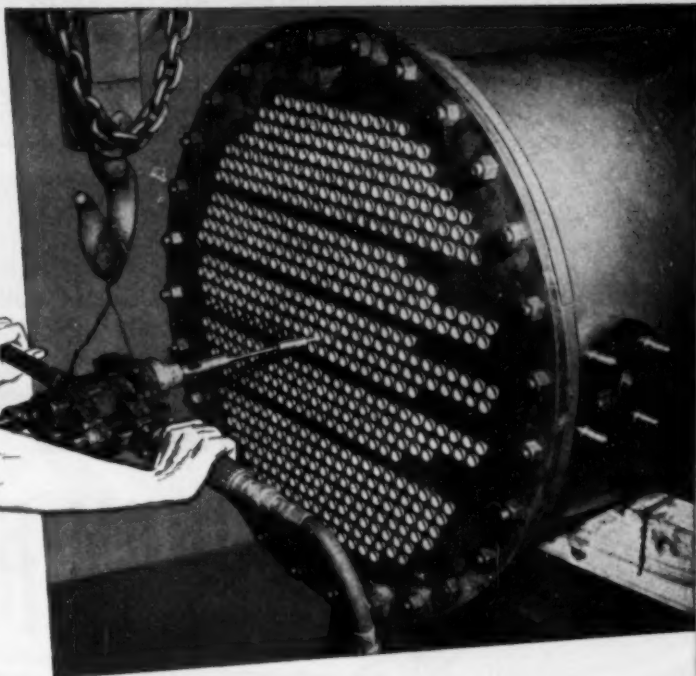
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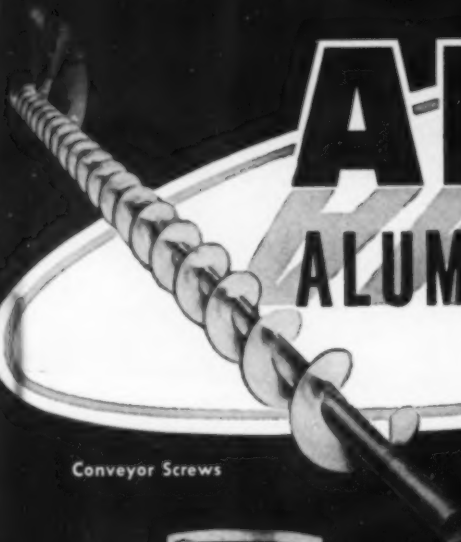




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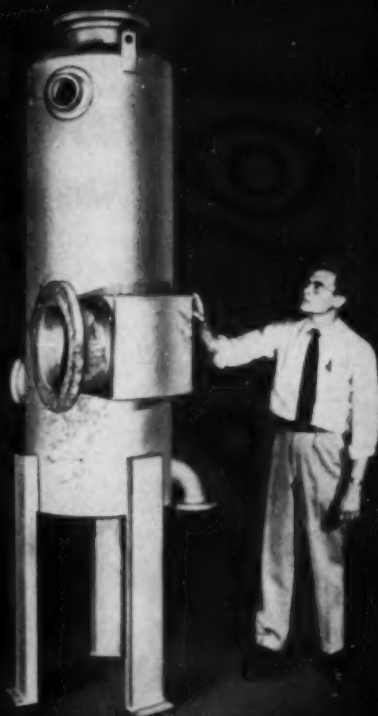
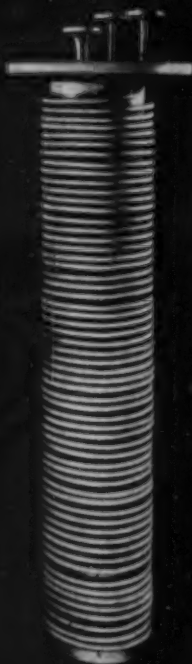
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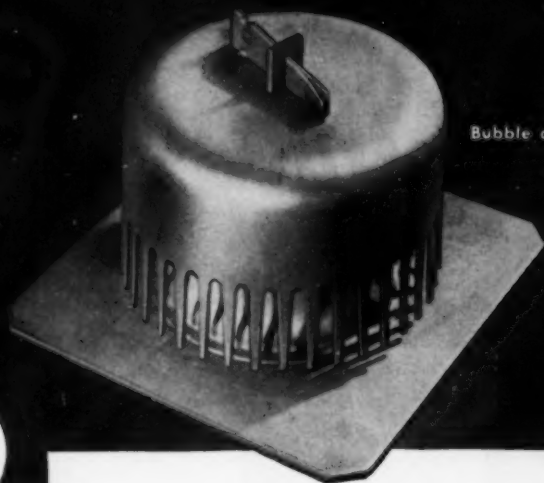
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Merely hoping a certain valve will do a required job is not enough. Maybe it will—at first. But if it's not the *right* valve in every particular—design, construction and materials—"it won't be long!"

There's a Powell Valve specially adapted to each and every flow control service. Why not always be sure with Powell?

Gate, Check, Globe and Y Valves, in
Bronze, Iron, Steel and Corrosion-
Resisting Metals and Alloys

*Quality fine
throughout
"The Line"*

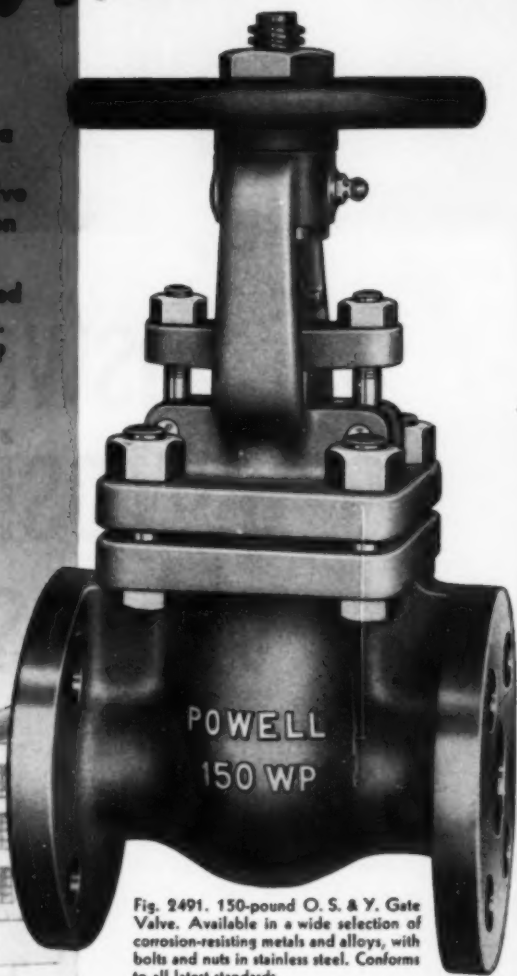
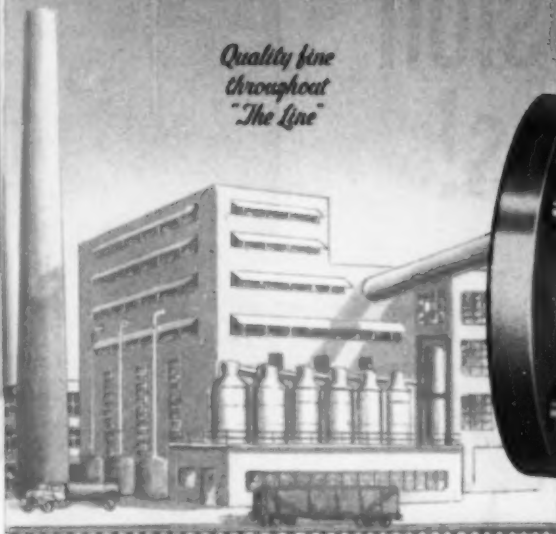


Fig. 2491. 150-pound O. S. & Y. Gate Valve. Available in a wide selection of corrosion-resisting metals and alloys, with bolts and nuts in stainless steel. Conforms to all latest standards.

POWELL

The WM. POWELL CO., 2525 Spring Grove Ave., P. O. Box 106, Station B, Cincinnati 22, Ohio

SEVEN SOLUTIONS TO THE *Sulfur Shortage*



Since sulfuric acid is vital to almost every industry, the current shortage of elemental sulfur, from which this acid is generally derived, is a serious matter and has a worldwide effect. Waste materials that can be converted into sulfuric acid and unworked sulfur bearing ores hold the

answer to the sulfur shortage. Chemico offers proven processes for utilizing such sources of sulfur. If you have a source, in commercial quantities, of any of the following materials, please give us details. We will then be glad to make specific recommendations without obligation.

WASTE MATERIALS

1. Spent Alkylation Acid, a refinery by-product in the manufacture of high octane gasoline, can be regenerated into fresh sulfuric acid of any desired strength.

2. Oil Refinery Sludge is another refinery by-product resulting from the treatment of petroleum fractions. The acid content is recovered as fresh acid of high strength.

3. Waste Iron Sulfate-Acid Solutions are by-products from steel mills and titanium pigment manufacturing plants. The sulfuric acid is concentrated for re-use and the iron sulfate converted to fresh sulfuric acid.

4. Smelter Gas results from metallurgical operations where sulfide ores are roasted preliminary to the recovery of metals. The gas is cleaned and processed into fresh sulfuric acid.

5. Coke Oven, Natural and Refinery Gases contain sulfur as hydrogen sulfide. This may be reduced to sulfur or extracted directly as a raw material for producing sulfuric acid.

SULFUR BEARING ORES

6. Pyrites and other metal sulfides are roasted to produce sulfur dioxide gas which is then converted into sulfuric acid.

7. Low-grade Surface Deposits containing sulfur in elemental form are treated by a new and economically sound process which recovers the high quality sulfur necessary for modern contact plant operation.

Chemico offers 37 years of experience in the design and construction of efficient plants for the manufacture of sulfuric acid and other heavy chemicals . . . on a one-contract, one-responsibility, performance-guaranteed basis.

CHEMICAL CONSTRUCTION CORPORATION

CONSULTING, DESIGNING AND CONTRACTING ENGINEERS

488 MADISON AVENUE, NEW YORK 22, NEW YORK

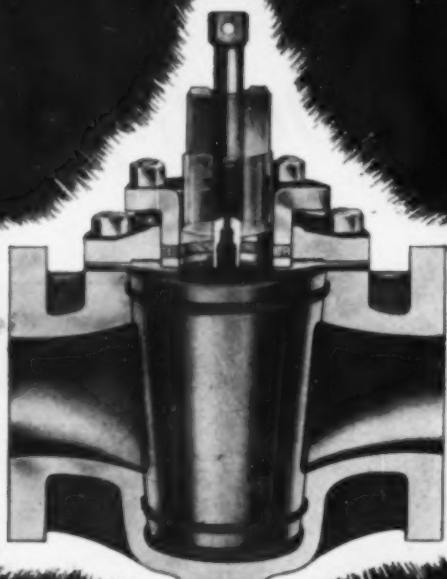
EUROPEAN TECHNICAL REPRESENTATIVE

CYANAMID PRODUCTS, LTD., LONDON W.C.2, ENGLAND • CABLES: CHEMICONST, NEW YORK



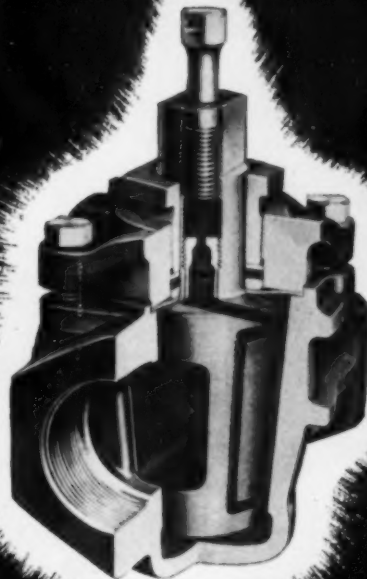
*Chemico plants are
profitable investments*

THESE VALVES "can take it!.."



NORDSTROM BOLTED GLAND TYPE

Made in sizes from 4" and larger
in semi-steel and Nordco steel



NORDSTROM SCREWED GLAND TYPE

Made in sizes from 4" and smaller
in semi-steel and Nordco steel

UNEXPOSED SEAT Fully protected from the line fluid, thereby avoiding corrosion and erosion
POSITIVE ROTARY ACTION Quarter-turn of tapered plug fully opens or closes
AUTOMATIC LUBRICATION Hypermatic insures constant feed and pressure

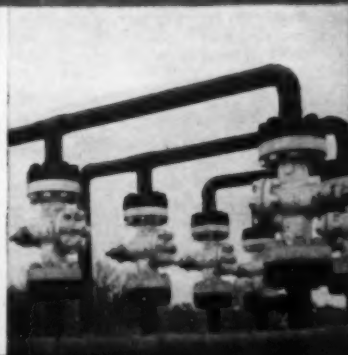
Nordstrom valves in circulating lines
of a continuous carbonator



Nordstrom gear operated valves
on fuel lines in a steam plant



Nordstrom Hypermatic valves
in a pressure reduction manifold



All Temperatures

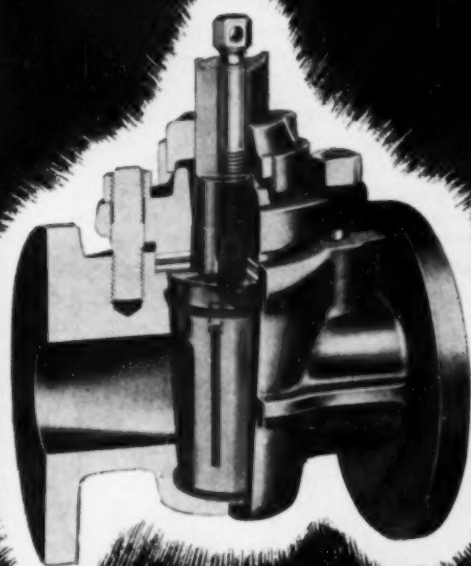
—150° to +1000°F.

All Pressures

VACUUM TO 15,000 LB. TEST

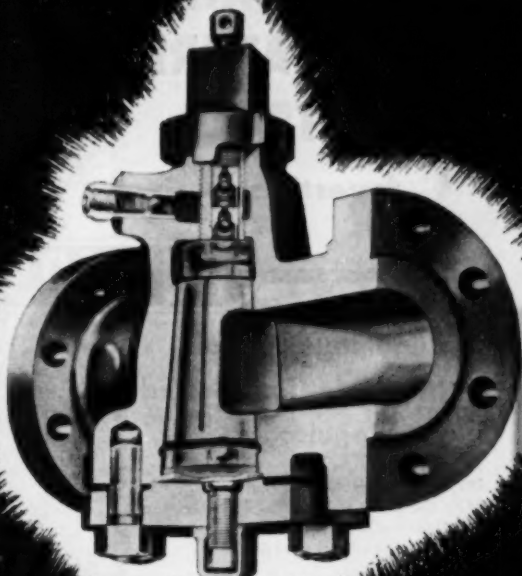
All Ways

IN TOUGHEST SERVICES



NORDSTROM 2-BOLT TYPE

Made in sizes 4" and smaller
in semi-steel



NORDSTROM HYPRESEAL TYPE

Made in sizes from 1 1/2" to 24" in Nordco carbon-
and alloy steel for pressures to 15,000 lb. test

Start replacing troublesome valves with Nordstroms

The best offense against leakage is a good defense. Bring up your present lines to top-notch condition by replacing old, troublesome valves with Nordstroms rather than trying to "patch" with valves that will again need replacement. By using Hypermatic lubricant, Nordstroms require only occasional attention, because Hypermatic gives the valves automatic lubrication.

They maintain lubricant pressure for longest periods so they keep in excellent condition, ready to operate, always easy to open or close. Nordstroms can be depended upon, in the toughest chemical services, as attested by the countless installations in most of the Nation's leading chemical processing plants in lines carrying corrosive and erosive fluids.

Ask for literature

Nordstrom
Valves



Rockwell MANUFACTURING CO.

400 N. Lexington Ave., Pittsburgh 2, Pa.
Offices in all principal cities

Before You Buy
JACKET WATER
TEMPERATURE
CONTROL
Investigate

POWERS

Complete Line of
Dependable, Time-Tested
Regulators

IMPORTANT ADVANTAGES that quickly pay back the cost of Powers self-operating and pneumatic controls for air compressors, diesel and gas engines:

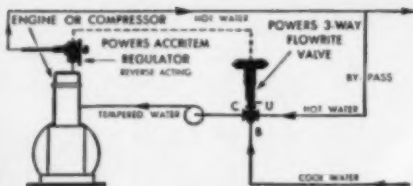
- Correct jacket water and lube oil temperature at all times, regardless of load or seasonal changes.
- Improved lubrication and cylinder liner wear.
- Fewer piston ring replacements.
- Saves Labor; increases efficiency.
- Reduces danger of piston seizure.
- Eliminates sludging.
- Lowers fuel and lube oil consumption.

Cost of Powers jacket water temperature control? About the same as a set of new piston rings. Powers regulators are unsurpassed for reliability and years of trouble free service.

Have a POWERS Engineer call to study your requirements for better jacket water temperature control. There's no obligation. Phone or write our nearest office.

CHICAGO 14, ILLINOIS • 2718 Greenview Avenue
 NEW YORK 17, NEW YORK • 231 East 46th Street
 LOS ANGELES 5, CALIF. • 1808 West 8th Street
 TORONTO, ONTARIO • 195 Spadina Avenue
 MEXICO, D. F. • Edificio "La Nacional" 601

(ENR)



One of Many Applications of
POWERS ACCRITEM REGULATOR and
FLOWRITE DIAPHRAGM VALVE—
 Compressed Air or Water Operated

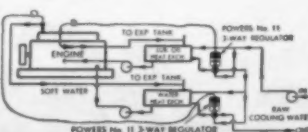
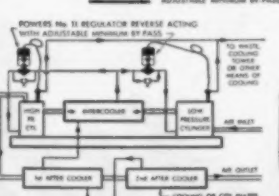
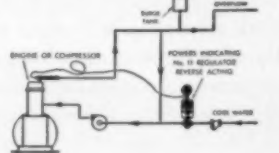
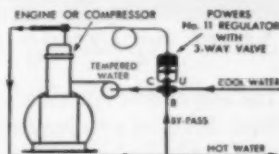
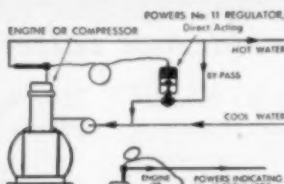
— Provides positive, dependable control for large size 3-way or 2-way valves. **Safety feature** of hook-up above: failure of air or water pressure allows only cooling water to flow through the valve to engine.



No. 11 Self-Operating TEMPERATURE REGULATORS



Provide dependable control for most applications. They're simple, ruggedly built, economical and easy to install. Especially suited for air compressors, diesel and gas engines. Temperature indicating regulator also available.



Established
 1891

THE POWERS REGULATOR CO.

OFFICES IN
 OVER 50 CITIES

**AN INVITATION
to manufacturers
with drying, cooling
or roasting problems...**

**LINK-BELT will assist in
developing your process**



Find the best method for drying, cooling, roasting. It's as easy as sending us samples of your materials. You see, Link-Belt maintains a fully-staffed, scientific, modern laboratory as a service to industry. Take advantage of these facilities... there's miniature equipment for small test-runs... full-scale set-up for large test-runs.

Even with a small sample, we will test-run your material, work out procedures in the laboratory that can be duplicated in your plant...

Many products become marketable only after commercially practicable drying, cooling or roasting processes have been developed. That's where Link-Belt can give you the answer in advance... before you've spent a cent!

More than 1000 such laboratory tests have already been made. And as a result, 500 Link-Belt Dryers now step up capacity and improve quality of over 100 different products.

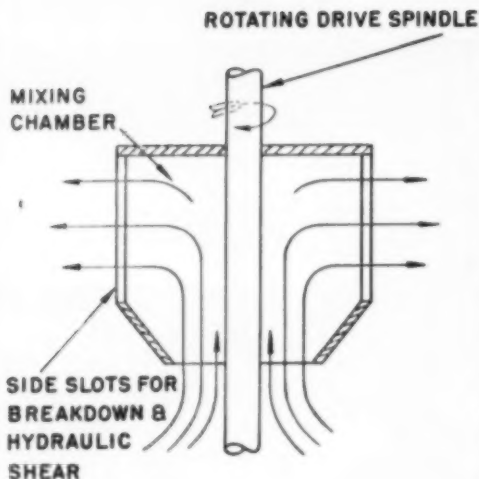
Ask for a test of your own materials. If you can't ship samples—ask for a unit on loan to try out right in your own plant. Why not contact your nearest Link-Belt office or plant for particulars? Now!

LINK-BELT COMPANY: Chicago 9, Indianapolis 6, Philadelphia 40, Atlanta, Houston 1, Minneapolis 5, San Francisco 24, Los Angeles 33, Seattle 4, Toronto 8, Springs (South Africa). Offices in principal cities.



NEW DISCOVERY

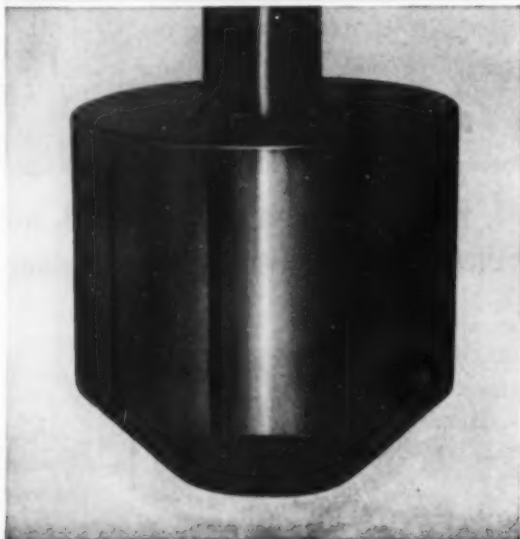
Premier Simplex Dispersators



The SIMPLEX DISPERSATOR is a slotted cylinder rotating at high speed. The centrifugal force resulting from this high-speed rotation forces the products through the slots under considerable pressure. A double shearing effect is thus obtained. The product is sheared at high speed as it passes through the slots; the columns of liquid emerging from the slots are further sheared as they make contact with the relatively slower-moving mass of liquid outside the cylinder.

MIXES IN FRACTION OF TIME REQUIRED BY PROPELLERS

Suppose you want a liquid/solid reaction to produce a gelatinous product. Normally, each solid particle becomes coated with a gelatinous layer. Until this insulating layer is removed, the reaction cannot be completed. Propellers remove the layer very gradually. The SIMPLEX DISPERSATOR shears off the gelatinous insulation from the solid particles almost immediately, with little or no slowing down of reaction time. Thus a process which may take hours or days with a propeller mixer can be completed in minutes or even seconds with a SIMPLEX DISPERSATOR.



VISUAL PROOF



(Above) Shows DISPERSATOR running at comparatively low speed, sucking up a heavy organic liquid and producing a finely divided dispersion, which is shown being thrown off the sides of the DISPERSATOR itself.



(Right) The two liquids are ortho nitro toluene and water. Speed of DISPERSATOR is low to show its action. Suction column of O.N.T. is shown entering the bottom of the DISPERSATOR and leaving in a dispersed state. If DISPERSATOR reaches its proper speed (3,000-4,000 r.p.m.'s) all of the O.N.T. would be dispersed in the form of an emulsion within a few seconds.

PREMIER MILL CORPORATION
2180 GENESEE STREET • GENEVA, NEW YORK

IN MIXING **Greatly Reduces Mixing Time**

Premier Duplex Dispersators

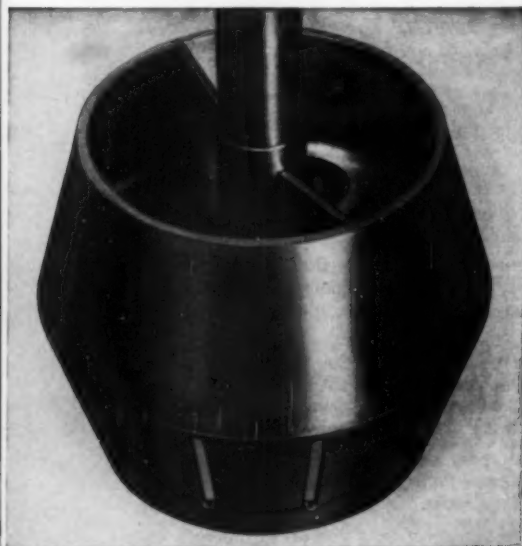
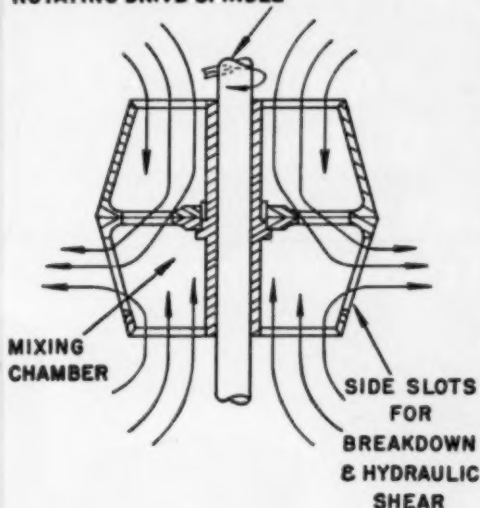
The success of the **SIMPLEX DISPERSATOR** in the high-speed, low-to-medium viscosity mixing field, has led Premier Engineers to develop a second model, the **DUPLEX DISPERSATOR**, which has extended the benefits of the Dispersator action into high-viscosity, low-speed applications.

Whereas the **SIMPLEX DISPERSATOR** has a single-flow direction, the **DUPLEX DISPERSATOR** permits *two-way* flow, by virtue of a double cone construction which forces liquids to enter the rotating cylinder from both top and bottom. This *two-way* flow forces intense mixing and wetting action in the lower cone before liquids escape through wall slots.

Thus the **DUPLEX DISPERSATOR** may be used effectively to mix or blend two liquids of different specific gravity. It is ideal for drawing heavy solids from the bottom and light materials from the surface to insure thorough wetting and dispersion.

The **DUPLEX DISPERSATOR**, due to its double-flow action, will mix fluids of greater viscosity than the single-cone **SIMPLEX DISPERSATOR**. This is an important function in the blending of color pastes and in promoting chemical reactions in mixtures which become highly viscous as the reaction is completed.

ROTATING DRIVE SPINDLE

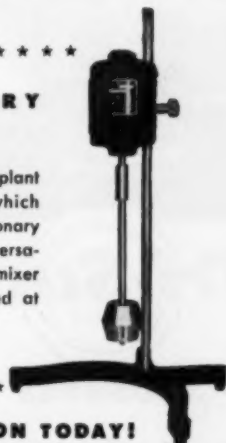


ASK OUR ENGINEERS

If you have processes where mixing, dispersing, or reacting time is excessive, tell your problem to our engineers. If you give full details, our engineers can help you by recommending the right model and size **DISPERSATOR** to solve your problem.

PATENTS APPLIED FOR
ASK OUR ENGINEERS

★
★ **LABORATORY**
★ **MIXER**
★
★ Laboratory or pilot plant
★ model available, which
★ shows the revolutionary
★ features of these Dispersa-
★ tors. You can try this mixer
★ on a small scale and at
★ low cost.
★
★ *****



MAIL THIS COUPON TODAY!

PREMIER MILL CORP.
2180 Genesee Street, Geneva, N. Y.

Send me full details of the **SIMPLEX DISPERSATOR** and the **DUPLEX DISPERSATOR**.

Name

Firm

Street and Number

City State

SEALED FOR SAFE DELIVERY!

**Ashland
Oil Products
are protected by
Tri-Sure Closures**



Tri-Sure
Reg. U. S. Pat. Off.
CLOSURES

"The 'Tri-Sure' Trademark is a mark of reliability backed by 29 years serving industry. It tells your customers that genuine Tri-Sure Flanges (inserted with genuine Tri-Sure dies), Plugs and Seals have been used.

AT ITS large and modern refineries in the Ohio Valley area, the Ashland Oil & Refining Company of Ashland, Kentucky, produces high-quality gasoline, motor oil, anti-freeze and volatile fluids.

These products are processed with the meticulous methods that are traditional at Ashland. And they are given the most reliable protection from leakage, tampering and evaporation—in drums equipped with *Tri-Sure Closures*®.

When Ashland customers see the Tri-Sure *heavy-gauge* seal and distinctive *octagonal flange*, they know they are getting *full drums—free of impurities*.

Give your customers this *proof* that you are protecting your product—and their interests. When you order drums, specify "Tri-Sure Closures"—and build the good will that every good product deserves.

**AMERICAN FLANGE & MANUFACTURING CO. INC., 30 ROCKEFELLER PLAZA, NEW YORK 20, N. Y.
TRI-SURE PRODUCTS LIMITED, ST. CATHARINES, ONTARIO, CANADA**

SURE BATCHING CONTROL



When movement of measured quantities of liquids is to be precisely controlled, Q.C.F. CYLINDRICAL Lubricated Plug Valves save time. Valve open, the flow moves faster through a valve passage having at least as much area as the pipe itself. Then... a fast quarter-turn—seconds if need be—and the valve is tight-closed! Why any other valve for precise fast control!

Battery of 4-inch Q.C.F. Lubricated Plug Valves controlling flow of resins and varnish at a large paint plant.

Q.C.F. CYLINDRICAL PLUG VALVES

Representatives in
50 Principal Cities

Ask for Catalog 4-CM, American Cast and Foundry Company,
Valve Division, 1501 East Ferry Ave., Detroit 11, Michigan

MONSANTO

CHEMICALS — PLASTICS

FOR YOUR INFORMATION

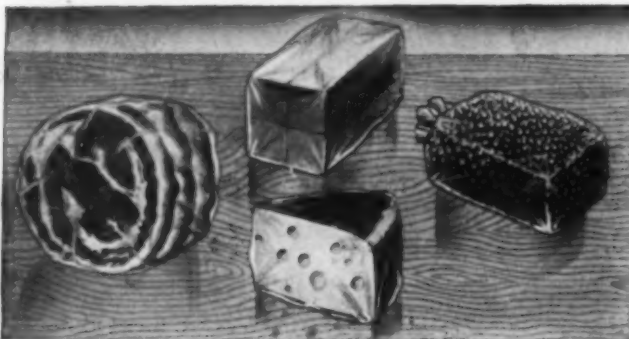
Every month Monsanto publishes these pages of pertinent information which may be useful to you. This issue discusses:

Plasticizers
Catalysts

Detergents
Wetting Agents

Further information will be furnished upon request.

Nontoxic plasticizers available to food packaging manufacturers



If you are manufacturing packages for foods, or if you have such products in the development stage, we suggest you investigate three Monsanto nontoxic plasticizers.

Santicizer® 141 (alkyl aryl phosphate), Santicizer B-16 (butyl phthalyl butyl glycolate) and Santicizer E-15 (ethyl phthalyl ethyl glycolate) all have been accepted as nontoxic plasticizers by the Bureau of Animal Industry of the United States Department of Agriculture.

While it will be necessary for you to get the bureau's approval on your nontoxic packaging materials, you can be sure that the

plasticizer in your formula will pass muster if you choose one of these Santicizers.

Many makers of packaging materials already are using Santicizers 141, B-16 and E-15. They are employed in coatings for milk cartons, in wrappings for margarine and containers for other foods. Employed in film for wrapping fresh meats, Santicizer 141 helps to prevent discoloration of the food.

For technical information and for assistance in perfecting your formulations, contact the nearest Monsanto Sales Office or mail the coupon.

Ortho-Nitrobiphenyl . . .

low-priced plasticizer that's efficient . . . and available

If costs and availability of plasticizers are headaches in your business, we suggest you investigate Monsanto's ortho-nitrobiphenyl today. ONB is efficient as a primary plasticizer or as an extender, and it is immediately available in any quantities you need. It sells for only 14½ cents a pound in truckloads or carlots.

Ortho-nitrobiphenyl (also known as ortho-nitrodiphenyl) is compatible with cellulose esters and ethers, polyvinyl chloride, polyvinyl butyral, polyvinyl acetate, styrene, rosin and rosin esters, modified phenolic resins, oil-soluble alkyd resins and vegetable oils. This wide compatibility, plus its low hydrolysis rate and low price, makes ONB an unusually attractive plasticizer.

Most resins, both natural and synthetic, can be plasticized with ONB. The amount of required plasticizer varies with the resins and the use of the finished product. The volatility of ortho-nitrobiphenyl is less than diethyl phthalate and greater than dibutyl phthalate.

Ortho-nitrobiphenyl is readily soluble in carbon tetrachloride, mineral spirits, pine oil, turpentine, benzene, acetone, glacial acetic acid and perchlorethylene. It is a good solvent.

For technical information on ortho-nitrobiphenyl, contact the nearest Monsanto Sales Office or mail the coupon for a copy of Monsanto Technical Bulletin No. OD-102.

Santicizer 8 eases shortage of plasticizers

Available in a day of shortages, Monsanto Santicizer 8 offers a solution to many a plastic manufacturer's problem. It imparts desirable characteristics to both plastics and coatings.

Santicizer 8, a light-yellow, viscous liquid, is readily soluble in all common organic solvents except petroleum hydrocarbons. It is only very slightly soluble in petroleum hydrocarbons. It is a valuable plasticizer for products required to withstand gasoline, greases and related products.

Santicizer 8 is an excellent plasticizer for cellulose acetate. It gives this plastic better brilliance and polish than any other plasticizer. It has light stability to meet the requirements of most molding compositions and imparts high tensile strength, elongation and flexibility to cellulose acetate sheets and films.

When plasticized with Santicizer 8, nitrocellulose lacquers have excellent flexibility, moisture resistance and adhesion. Combined with Santolite® MHP, Santicizer 8 is excellent for the manufacture of lacquers resistant to aliphatic hydrocarbons.

In shellac, Santicizer 8 greatly increases flexibility and has a softening effect, but does not impair adhesion.

Stable adhesives with good adhesion and flexibility are produced by Santicizer 8 in polyvinyl acetate.

Santicizer 8 is highly compatible with proteins and compatible to at least 50% in zein and casein coatings. It improves flexibility, water resistance, gloss and adhesion. It is one of the best plasticizers known for synthetic polyamides such as nylon. It lowers the melting point and aids in processing, improving flexibility and toughness without adverse effects on other properties.

For data and information on assistance in formulating, contact the nearest Monsanto Sales Office or mail the coupon.

MAIL COUPON for Technical Bulletin O-70, "Monsanto Plasticizers in Polyvinyl Chloride Film and Sheet."

SANTOMERSE No. 1...all-purpose detergent and wetting agent



STEROX CD, one of the family of Monsanto Detergents, is useful in controlling dusting and sudsing.

Efficient, economical Monsanto Steroxes made for industrial uses

Monsanto's quintet of Steroxes, designed primarily for industrial applications, are efficient and economical to use in processes requiring lowered surface tension, wetting out, emulsifying or cleaning.

All Steroxes are nonionic liquids. Sterox[®] SE and SK are 100% active. Sterox 5 and 6 are the same as SE and SK, respectively, except that they are 85% active. Sterox CD is 100% active and especially useful in controlling dusting in dry compounded detergents. Because of its controlled sudsing properties, Sterox CD is the answer to the need for a surface-active detergent in cleaning compounds where excessive sudsing cannot be tolerated.

Mail the coupon for: Bulletin P-129 (Sterox CD); Bulletin P-133 (Sterox SE and SK); Bulletin P-136 (Sterox 5 and 6).

Quick delivery of toluenesulfonic acid

If you use toluenesulfonic acid, or if your research can discover uses for the product, you can depend upon Monsanto to make prompt shipment of quantities you need.

Toluenesulfonic Acid, Technical

Formula: CH_3

Molecular Weight:
172.20



SO_3H

Standard Form: Liquid or semicrystalline solid.

Specifications: Viscous liquid or semicrystalline solid with a greenish-to-black color; toluenesulfonic acid 94.0% min., H_2SO_4 1.0% max., water 2.0% max., toluene 0.2% max.

General Information—Properties: A mixture of approx. 80% para isomer and 20% ortho isomer.

Uses: In the manufacture of dyestuff intermediates and as a catalyst in certain organic reactions.

For prices, contact the nearest Monsanto Sales Office or mail the coupon.

Serves in many industrial processes

Numerous textile mills, metal-working industries and others requiring a surface-active agent for wetting, spreading, penetrating, emulsifying or cleaning find Santomerse[®] No. 1 an efficient employee. Cleaning compounds purchased by many concerns have Santomerse No. 1 as an important ingredient.

Santomerse No. 1, an anionic detergent, has a minimum of 40% active alkyl aryl sulfonate, the remainder being principally inorganic builders. This has been found to be the best combination for efficiency and economy.

Santomerse No. 1 is effective in hard or soft water, in alkaline or acid solutions, in hot or cold operations. Santomerse No. 1 can be used in operations where the pH is critical because it assumes the pH of the solution in which it is used.

Among the many applications of Santomerse No. 1 are the following which may suggest uses in your business:

AGRICULTURAL SPRAYS

Used as a wetting and dispersing agent, Santomerse No. 1 increases the effectiveness of the spray.

DEHAIRING HOGS

Santomerse No. 1 in the scalding vat speeds up the removal of hair and scurf.

DAIRY CLEANERS

Santomerse No. 1 adds to the efficiency of acid, neutral and alkaline cleaners.

RAILROAD CAR CLEANERS

Santomerse No. 1 improves the detergency of acid-type cleaners to remove scale and road grime.

METAL INDUSTRY

Santomerse No. 1 in the acid bath for cleaning, treating or pickling metal improves operations and the quality of the work.

If your industrial processes require a detergent or wetting agent, investigate Santomerse No. 1. Contact the nearest Monsanto Sales Office or mail the coupon for a copy of the booklet, "Santomerse No. 1, all-purpose wetting agent and detergent."

HURRY! HURRY! HURRY!

Unload tank cars, carboys and returnable drums promptly and send them back to your chemical supplier. Containers are short. They're urgently needed. Your help will be appreciated sincerely.



PROPERLY STABILIZED vinyl plastics, using HB-40 as an extender plasticizer, have good light and heat stability.

Bright colors in vinyls are now possible with Monsanto HB-40

Monsanto HB-40 (partially hydrogenated terphenyl) is an excellent low-cost plasticizer that is practically water-white. It may be used in clear and tinted vinyl plastics without detracting from shades or transparency.

HB-40 is relatively nontoxic... strong in moisture resistance... is nonmigratory. It has excellent electrical characteristics. HB-40 gives a "dry hand" and increased tensile strength.

Technical data will be sent promptly in response to your request by coupon or to the nearest Monsanto Sales Office.

MONSANTO CHEMICAL COMPANY, 1700 South Second Street, St. Louis 4, Missouri. District Sales Offices: Birmingham, Boston, Charlotte, Chicago, Cincinnati, Cleveland, Detroit, Los Angeles, New York, Philadelphia, Portland, Ore., San Francisco, Seattle. In Canada, Monsanto (Canada) Ltd., Montreal.

*Reg. U. S. Pat. Off.



SEND INFORMATION:

- ☐ HB-40. ☐ Nontoxic Sanitizers.
☐ Sanitizer B. ☐ Toluenesulfonic Acid.

SEND LITERATURE:

- ☐ Bulletin Q-70 (Polyvinyl Chloride Plasticizers).
☐ Booklet, "Santomerse No. 1."
☐ Bulletin QD-102 (Ortho-Nitrophenyl).
☐ Bulletin P-129 (Sterox CD).
☐ Bulletin P-133 (Sterox SE and SK).
☐ Bulletin P-136 (Sterox 5 and 6).

MONSANTO CHEMICAL COMPANY

1700 South Second Street, St. Louis 4, Missouri

Please send, without cost or obligation, information or literature as indicated at the left.

Name.....Title.....

Company.....

Street.....

City.....Zone.....State.....

SULPHUR

***Interesting Facts Concerning This Basic Raw Material from the Gulf Coast Region**

***MOLTEN SULPHUR**




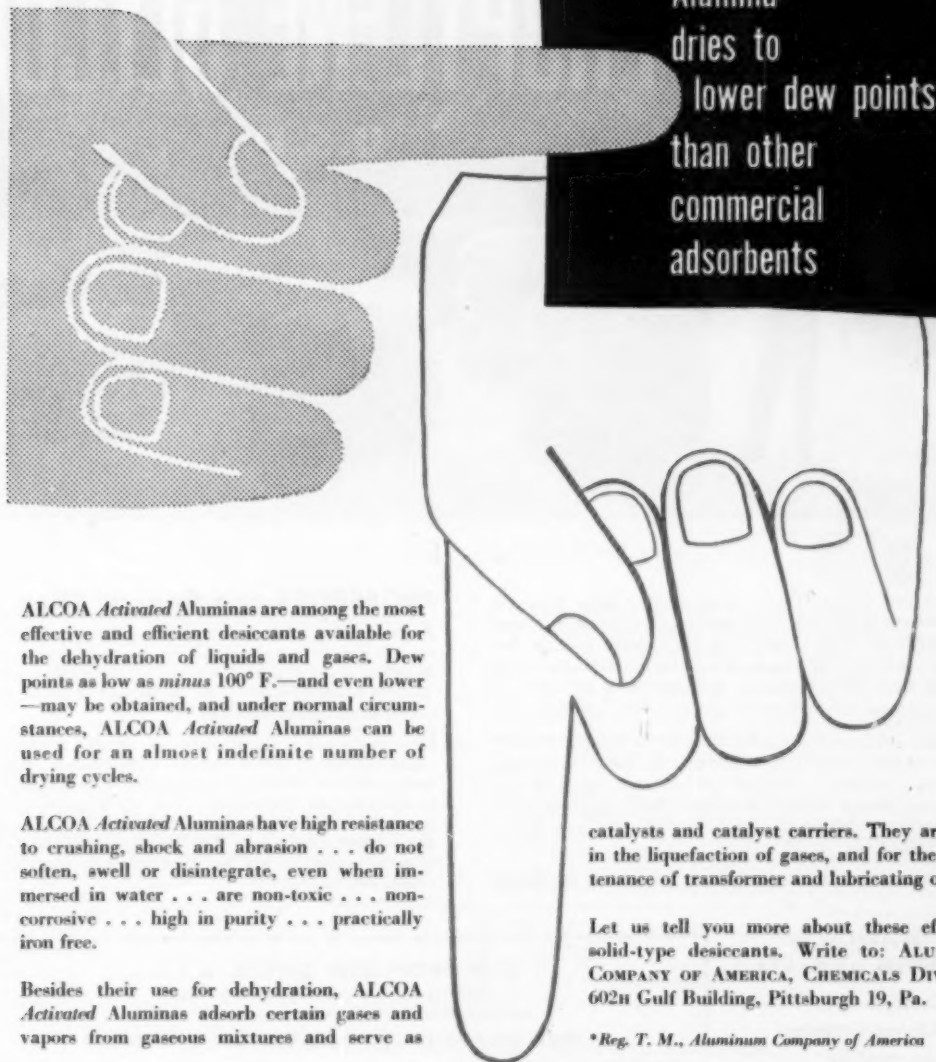
The discharge lines from the wells deliver the sulphur into sumps at collecting stations which are located near the area being "steamed."

The sump is dimensioned to suit operating conditions, as well as the number of wells supplying sulphur. Cast iron has been found the most suitable material for lining the sump, and for the steam coils on the bottom and at the sides which keep the sulphur in a liquid state. When the sump is reasonably full, pumps force the liquid sulphur through insulated pipe lines to the vats. The pumps are especially designed for this service, the moving parts being either submerged in liquid sulphur or steam-jacketed.

Loading operations at our
Newgulf, Texas' mine



TEXAS GULF SULPHUR CO. INC.
75 East 45th St.  New York 17, N. Y.
Mines: Newgulf and Moss Bluff, Texas



ALCOA
Activated*
Alumina
dries to
lower dew points
than other
commercial
adsorbents

ALCOA *Activated* Aluminas are among the most effective and efficient desiccants available for the dehydration of liquids and gases. Dew points as low as *minus 100° F.*—and even lower—may be obtained, and under normal circumstances, ALCOA *Activated* Aluminas can be used for an almost indefinite number of drying cycles.

ALCOA *Activated* Aluminas have high resistance to crushing, shock and abrasion . . . do not soften, swell or disintegrate, even when immersed in water . . . are non-toxic . . . non-corrosive . . . high in purity . . . practically iron free.

Besides their use for dehydration, ALCOA *Activated* Aluminas adsorb certain gases and vapors from gaseous mixtures and serve as

catalysts and catalyst carriers. They are used in the liquefaction of gases, and for the maintenance of transformer and lubricating oils.

Let us tell you more about these efficient, solid-type desiccants. Write to: ALUMINUM COMPANY OF AMERICA, CHEMICALS DIVISION, 602H Gulf Building, Pittsburgh 19, Pa.

*Reg. T. M., Aluminum Company of America

Alcoa Chemicals



ALUMINAS and FLUORIDES

ACTIVATED ALUMINAS • CALCINED ALUMINAS • HYDRATED ALUMINAS • TABULAR ALUMINAS • LOW SODA ALUMINAS
ALUMINUM FLUORIDE • SODIUM FLUORIDE • SODIUM ACID FLUORIDE • FLUORINIC ACID • CRYOLITE • GALLIUM



FACTS about PROPYLENE GLYCOL

U.S.P.

PROPYLENE GLYCOL, U.S.P., made by The Dow Chemical Company, is a product of consistent, high purity prepared specifically for tobacco, food, drug and cosmetic use. The fact that it meets the high standards required for inclusion in the United States Pharmacopoeia indicates its applicability to pharmaceutical preparations, as well as to foods and cosmetics.

To assist you in evaluating the functions of propylene glycol, U.S.P. in your product, Dow presents the following information on a number of practical uses for this highly efficient chemical. Despite current shortages, Dow continues to be interested in helping you solve your production and experimental problems.

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

PROPERTIES and General Uses

An outstanding characteristic of propylene glycol, U.S.P. is its solubility in all proportions in water. Moreover, it will dissolve and put into water solution many organic chemicals. Thus, it is widely used in the preparation of foods, flavors, cosmetics and pharmaceuticals.

Propylene glycol is also an extremely effective softening and moistening agent, as indicated by the hygroscopic quality of water solutions containing large amounts of the chemical, plus its characteristic plasticizing action. As a moisture control agent, it is used in tobacco for cigarettes. Propylene glycol also inhibits mold growth. It is used to extend the shelf life of certain foods, as well as to prevent mold contamination of idle food machinery.

ADVANTAGES OF PROPYLENE GLYCOL, U.S.P.

1. Odorless
2. Relatively tasteless
3. Low volatility
4. Acceptable in foods
5. Emulsifying aid
6. Wetting agent
7. Humectant
8. Preservative
9. Plasticizer
10. Excellent solvent

DOW PROPYLENE GLYCOL, U.S.P.

Conforms to or exceeds the specifications
established by the U.S. Pharmacopoeia XIV (1950)

INTERPRETATION OF U.S. PHARMACOPOEIA SPECIFICATION

Specific Gravity @ 25°/25°C.....	1.035-1.037
Distillation Range (Method 2 U.S.P. XIV) I.B.P.-D.P.....	185-195°C.
Identification.....	Passes Tests
Ash.....	Not more than 0.007%
Acidity (As Acetic Acid).....	Not more than 0.0115%
Chloride.....	Not more than 0.07%
Sulfate.....	No Turbidity*
Heavy Metals.....	Not more than 5 p.p.m.
Arsenic (as As ₂ O ₃).....	Not more than 2 p.p.m.

*Method: Dilute 5 cc. of propylene glycol with 15 cc. of distilled water and add 5 drops of Hydrochloric Acid and 5 drops of Barium Chloride T.S.

This is No. 3 of a series of Dow advertisements you may wish to keep on file for reference and information. Write Dow for reprints.

Propylene Glycol in FOODS



Because of its solvent, preservative, hygroscopic and wetting properties, and especially because of its economy in use, propylene glycol has found wide acceptance in the food field. Apparently, the only class of flavoring raw materials not sufficiently soluble in propylene glycol for the practical preparation of flavor solutions is the citrus oils. However, by using edible wetting agents, it is possible to prepare a 5% orange oil colloidal dispersion in propylene glycol which, to all appearances, will be a solution.

In addition to the preparation of flavor solutions, propylene glycol, U.S.P. is being used as a solvent for the extraction of vanilla flavor from vanilla beans and also in the preparation of a coffee flavor from ground roasted coffee. As a corollary to the flavor use of propylene glycol, many manufacturers have found that it makes an excellent food color solvent and that its use necessitates only very slight alterations in basic food color formulas.

Another interesting and relatively undeveloped use of propylene glycol is in increasing the effectiveness of shortening in the production of baked goods. Apparently the emulsifying or wetting action of the chemical aids in the dispersion of the shortening throughout the batch, thus permitting the use of reduced amounts of shortening. Much investigation remains to be done on this phase of propylene glycol use, but it is apparent that a definite benefit can be obtained.

Being a hygroscopic material, propylene glycol in sufficient concentrations tends to attract moisture from the air and, as a result, baked goods, to which a very small proportion of propylene glycol has been added, have a considerably enhanced shelf life.

This preservative action, so apparent in the use of propylene glycol in baked goods, points logically to its use in other food products which require a preservative. Actual laboratory tests have shown that a 15% concentration of propylene glycol will inhibit the growth of mold on nutrient media, and it is quite possible that a smaller concentration would retard the growth of spoilage organisms under less ideal growing conditions. Although the subject has not been fully explored, there is reason to believe that many solid foods can be placed on the market in better condition through the use of small quantities of propylene glycol.

PHARMACEUTICALS



The same qualities which make Dow propylene glycol, U.S.P. useful in food and flavoring preparations can be of great assistance in preparing pharmaceutical formulas. Here it acts as a carrier, solvent, emollient, humectant, lubricant and preservative.

The manufacturer of pharmaceutical preparations, whether for internal consumption, topical application or injection, must first solve the problem of finding a solvent which, in addition to being a good carrier, forms an acceptable medicinal. Propylene glycol, U.S.P. has been used in many approved pharmaceutical preparations and, in many cases, its preservative action is of considerable importance.

The versatility of the solvent properties of propylene glycol, U.S.P. applies to many organic chemicals used in the field of chemotherapy. Its use therefore should be considered in many estrogens, antiseptics, salves, elixirs, ointments and other types of pharmaceutical preparations.



COSMETICS

Dow propylene glycol, U.S.P. is used as a carrier, emollient, humectant, and preservative in many types of cosmetics. A great number of manufacturers of creams, lotions and similar products have discovered the advantages of propylene glycol's soothing and softening effect without residual stickiness. Propylene glycol can often be used in place of a more expensive ingredient and often will yield a superior product. In many cases, the addition of propylene glycol requires only a very slight change in the old formula to provide a high quality cosmetic.

Propylene glycol has been found effective in the preparation of lotions (whether non-alcoholic, mildly alcoholic or strongly alcoholic), cold creams and "all purpose" creams, hormone creams, vanishing creams, practically every type of facial make-up, permanent waving solutions and wave set solutions, shaving creams, soaps, shampoos and sun tan preparations.

This material is presented for what assistance it may give and is merely to be taken as indicative of the characteristics of DOW propylene glycol, U.S.P. and is not to be construed as specific recommendations.

WRITE DOW FOR INFORMATION AND TECHNICAL ASSISTANCE.

The Dow Chemical Company, Dept. OC-17,
Midland, Michigan

- ☐ Please send _____ reprints of this advertisement.
☐ Please send me additional literature about propylene glycol, U.S.P.

Name _____ Title _____

Company _____

Address _____

City _____ State _____

DOW

CHEMICALS

INDISPENSABLE TO INDUSTRY
AND AGRICULTURE



GET THE MOTOR that Cleans Itself

DROP MOTOR MAINTENANCE COSTS to a new low by reducing motor cleaning operations. And this new Allis-Chalmers Type APZ tefc motor makes maintenance costs lower than ever before on this type of motor.

Here's Why

Concealed air passages and pockets have been eliminated; dirt cannot build up to cause overheating. Cooling air is blown over the ribbed cast iron frame and bearing housings carrying dirt away with it. How about oily dirt that sticks? It can be wiped or blown off without stopping the motor.

Rigid Construction

The frame is of rigid cast iron which

not only has high inherent corrosion resistance, but also holds bearings in alignment. Bearings are prelubricated at the factory and should need no attention for years. Tapped holes with pipe plugs to permit regreasing and to provide grease relief are standard equipment.

Get All The Facts

The new Allis-Chalmers Type APZ totally-enclosed fan-cooled chemical motor is built in all NEMA standard frame sizes from 224* to 505. Also in explosion-proof type.

Your A-C Authorized Dealer or District Office has complete information. Call today, or write Allis-Chalmers, Milwaukee 1, Wisconsin. Ask for Bulletin 51B6144.

A-3997

Texrope and Vari-Pitch are Allis-Chalmers trademarks.

ALLIS-CHALMERS



**Sold . . .
Applied . . .
Served . . .**

by Allis-Chalmers Authorized Dealers,
Certified Service Shops and Sales Offices
throughout the country.



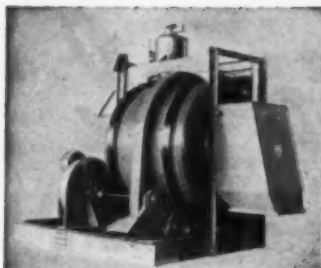
CONTROL — Manual, magnetic and combination starters; push button stations and components for complete control systems.

TEXROPE — Belts in all sizes and sections, standard and Vari-Pitch sheaves, speed changers.



PUMPS — Integral motor and coupled types from 3/4 in. to 72 in. discharge and up.

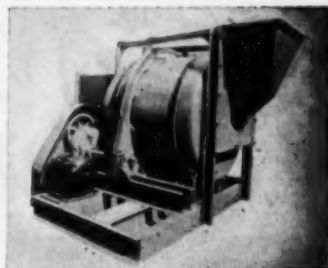
*Similar design non-ventilated motors Type APK, also available in frames 203 to 224 inclusive.



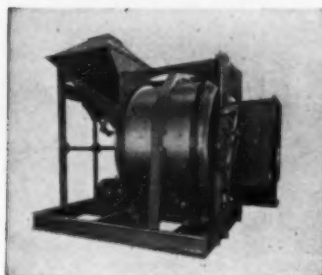
CHEMICALS—Equipped with liquid measuring tank for use in various chemical applications.



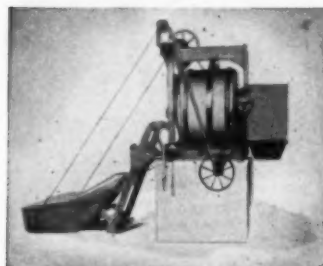
CHEMICALS • DRUGS • PLASTICS METALS • FOOD • CANDY—Pan is tilted and rotated by motors. Capacities up to 3090 lb.



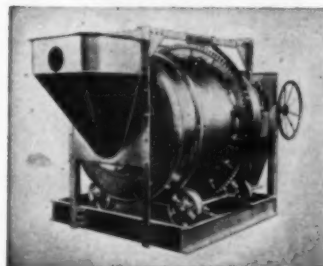
COMPOSITION MATERIALS • INSULATING AND REFRACTORY CHEMICALS • CLAY • GLASS BATCHES • FOUNDRY CORE SAND—13 cu ft dry mixer on skids.



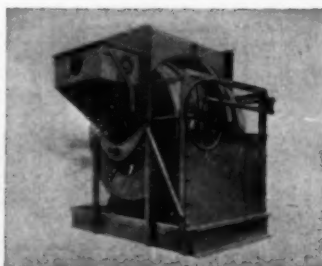
ENAMEL FRITS • GLASS—50 cu ft dustproof mixer. Fully-automatic, electrically controlled charging and discharging.



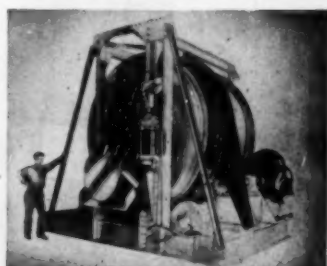
FURNACE CHARGES • GLASS BATCHES—28 cu ft mixer with elevating power loader.



SOAP POWDER • PIPE TOBACCO • SNUFF—Dustproof mixer for blending and mixing.



FERTILIZER—Standard sizes, $\frac{1}{2}$, 1, 2-ton capacity. Also used for asbestos products, etc.



FURNACE CHARGES—One of the largest industrial mixers—batch capacity of 260 cu ft.

How To Straighten Out Your Mixer Problems

What do you mix? Here's a partial line-up of industrial mixers bearing the famous Worthington-Ransome trademark—which means the right design for every type of mix.

And you'll find in every mixer the following Worthington-Ransome features: *thorough mixing* (or blending) of even the finest dry materials or colors in any proportion . . . *clean discharge* . . . *dustproof design* (where required) . . . *heavy-duty construction*.

For solution of your particular mixing problem or for free bulletins, write: Worthington Pump and Machinery Corporation, Ransome Industrial Mixer Division, Dunellen, New Jersey.

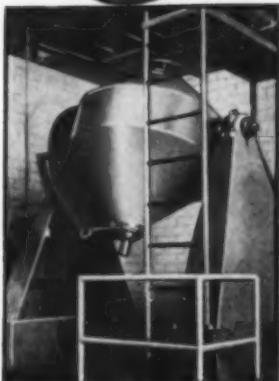
WORTHINGTON



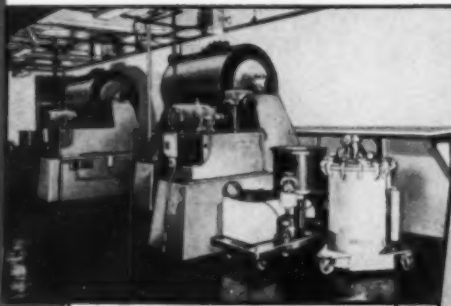
YR.1.1

put International

TO WORK IN YOUR PLANT
TO CUT COST AND
IMPROVE PRODUCTION



"INTERNATIONAL"
TYPE 6E DRY BLENDER IN A
FOOD PROCESSING PLANT



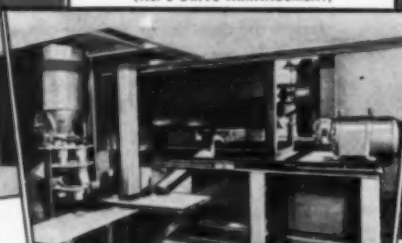
"INTERNATIONAL" BALL MILLS IN AN
ENAMELING PLANT
(No. 5 DRIVE ARRANGEMENT)



"INTERNATIONAL" AGITATOR
INSTALLED IN FISH CANNERY
COOKER



"INTERNATIONAL"
TYPE 9 RIBBON MIXER IN A
PHARMACEUTICAL LABORATORY



"INTERNATIONAL" RIBBON MIXER IN A PLANT
MAKING AUTOMOTIVE RADIATOR SOLVENTS
AND CLEANING COMPOUNDS



"INTERNATIONAL"
SIDE ENTRANCE MIXERS
HOPPER CAR INSTALLATION



"INTERNATIONAL"
PORTABLE MIXERS IN A
GELATIN PRODUCTS PLANT

INTERNATIONAL PROCESSING EQUIPMENT is the logical answer to problems of Blending, Treating, Mixing and Grinding of Chemical components in any desired size, capacity or requirement

Remember— "INTERNATIONAL" Builds and Guarantees the equipment you need to get more production at lowest operating cost. Ask for Special Catalog and complete information on any equipment, today. No obligation, of course.

**INTERNATIONAL
ENGINEERING, INC.**

DAYTON 1, OHIO

DISTRICT REPRESENTATIVES IN PRINCIPAL CITIES

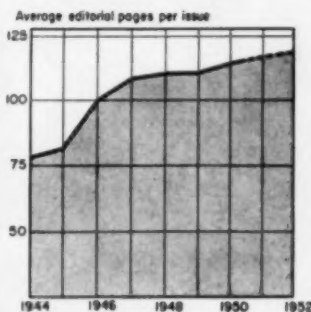
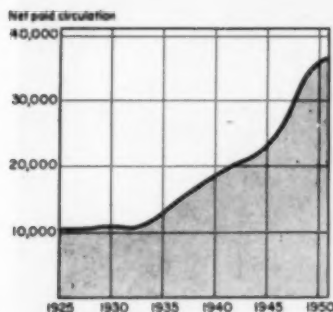
NEW YORK — 15 Park Row
CHICAGO — 407 S. Dearborn St.



TYPE
"SGR"

Tap Entering
AGITATOR

Memo from the Editor John R. Callahan



Just a Little Inside Dope

Don't bother to read this if you're looking for engineering information—you won't find it here. But you might get interested in these behind-the-scene facts about CE.

A couple of months ago when I was in Pittsburgh chatting with a small group of engineers, somebody asked me about CE's circulation. That gave me the idea of polling the group, which I did.

I asked each of those 17 engineers for his estimate on how many subscribers we have. The guesses ranged from 3,500 to 65,000. The average was 19,500—almost 50 percent on the low side.

The interest that this little poll stirred up reminded me of another bull session several years ago in Houston. That one, too, started off with a similar question. It lasted for close to three hours.

Upshot of it all was that I figured more of you might like to hear about some of the facts I gave those groups in Pittsburgh and Houston. Here goes.

► Actually, CE's circulation—net paid circulation as the Audit Bureau of Circulation auditors call it—has grown until it is now close to 37,000 (see cut).

(Which, by the way, is the largest paid circulation of any monthly chemical publication in this country—in the world, probably. And something we can't help but be a little proud of.)

How does this circulation stack up against the total number of chemical engineers in the country? We really don't know, but we do think it's a healthy one. And of course we like to point out the slope of our growth curve. Especially since in general we

limit our circulation to those people really in what I call "applied process engineering."

► So it's actually no accident that 71 percent of CE's subscribers hold jobs in private chemical manufacturing and processing firms. Another 12 percent are consultants or are connected with independent laboratories. About 7 percent are students; less than 3 percent are professors or instructors.

Of all the states, New York naturally has the largest number of subscribers—16 percent of our U. S. total. New Jersey and Pennsylvania come next. California is fourth with a little over 7 percent.

► Occasionally someone gossips it around that "CE runs only 40-50 pages of editorial matter in an issue"—another figure that's about 50 percent off.

Actually, for the first five months of this year we carried an average of 116 pages of editorial material per issue (see cut). We could—and would—jack this up except for one good reason: most of you don't really want any more.

► Our business department tells me that CE carries more pages of ads than any other monthly publication—of any type—in the world. We're proud of that, too, for it means that advertisers recognize the importance of our chemical engineer readers.

And when it's all added up, about three out of four of you agree that these ads (now close to 300 pages an issue) are one of the most helpful fea-

tures of CE. For the engineer who wants to keep up on who's doing what with equipment, materials and services, they are a storehouse of practical information.

► You may be interested to learn that CE was founded (as *The Electrochemical Industry*) back in September, 1902—exactly 49 years ago. Then the subscription price was \$2 a year. Now it is \$3 (or about \$1.20 in terms of the 1902 dollar).

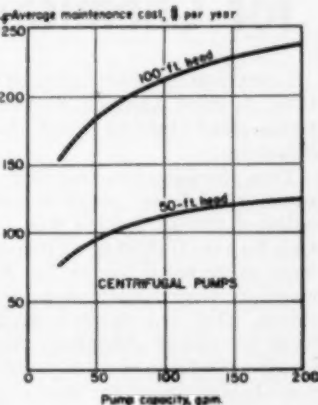
► One of the questions I often get is, "What percentage of the manuscripts sent in to you do you print?" I don't have any actual figures, but my guess is about 60 percent of them.

The reason for this low (or is it high?) figure is that many of these manuscripts really fit better into some other publication. In these cases, we try to recommend the proper journal. After all, it doesn't do anybody—including the author—any good to have an article appear where it doesn't belong.

All this leads up to another frequent question: "How do you decide whether or not to publish a particular manuscript?"

But that's the subject of another—and a longer—story.

Next Month . . .



How well can you predict your equipment maintenance costs? Few engineers, we've learned, can do it accurately. Next month's article by well-known Jackson Leonard will give you original figures—in cold dollars-and-cents—on just how much you do dish out for most types of processing equipment. Watch for it.



This Steel-Service Team for Chemical Processing Requirements

Convenient to manufacturing centers from coast to coast, thirteen Ryerson steel-service plants stand ready to supply chemical process industries.

True, shortages resulting from the twin pressures of defense requirements and unprecedented civilian demand may make it impossible for us to furnish every item on every order, much as we would like to. But it is likely that many of your requirements are among the carbon, alloy and stainless steels we have on hand for prompt shipment. And experienced Ryerson steel men are always glad to work with you—help you make the most of available steel.

From switchboard to shipping floor all of us are ready to give you prompt service whenever humanly possible. So call us when you need steel.

PRINCIPAL PRODUCTS

CARBON STEEL BARS—Hot rolled and cold finished

STRUCTURALS — Channels, angles, beams, etc.

PLATES—Many types including Inland 4-Way Safety Plate

SHEETS—Hot and cold rolled, many types and coatings

TUBING — Seamless and welded, mechanical and boiler tubes

ALLOYS—Hot rolled, cold finished, heat treated

STAINLESS—Alloyed bars, plates, sheets, tubes, etc.

REINFORCING—Bars and accessories, spirals, wire mesh

BABBITT—Glyco bearing metal, also Ryertex plastic bearings

MACHINERY & TOOLS—For metal fabrication

RYERSON STEEL

JOSEPH T. RYERSON & SONS, INC. PLANTS AT: NEW YORK • BOSTON • PHILADELPHIA • CINCINNATI • CLEVELAND
DETROIT • PITTSBURGH • BUFFALO • CHICAGO • MILWAUKEE • ST. LOUIS • LOS ANGELES • SAN FRANCISCO

Chemical Engineering

WITH CHEMICAL & METALLURGICAL ENGINEERING

AUGUST 1951

Paying for Professional Progress

An enduring obligation of any profession is to pass on to succeeding generations the accumulated knowledge and experience of those who have gone ahead. Too often we forget our debt to the past. We take for granted the achievements of our predecessors in the chemical industry. In the surge to get ahead we fail to realize that progress has not always been so rapid or so sure.

So, it is appropriate that all of us should join next month in the world chemical conclave and the ceremonies attendant to the diamond jubilee of the American Chemical Society. They promise a rewarding experience.

Modern chemistry had its beginning almost simultaneously with the birth of this country. Lavoisier presented his theory of combustion in 1772. Priestley discovered oxygen in 1774. Galvani's classic experiments with electricity began in 1775. Cavendish, Scheele and Le Blanc were making chemical history in Europe during the Revolutionary War in America. A century later, April 6, 1876, thirty-five chemists met in New York City to form the American Chemical Society. Next month many thousands of its members and guests from all over the world will meet to celebrate three-quarters of a century of chemical progress. Two weeks of conferences, ceremonies and technical sessions will explore every phase of chemical science and technology.

For the first time since 1912 America will be host to both the International Union and the International Congress of Pure and Applied Chemistry. These world organizations, representing thirty-two member nations, are the international courts of final appeal on scientific and professional matters for chemists. Their sessions in New York will be followed by official gatherings in Washington under the auspices of the National Academy of Sciences and the Division of Chemistry and Chemical Technology of the National Research Council. A joint banquet will help the United States Bureau of Standards to celebrate its fiftieth birthday. Such is the program for the busy historians of the chemical profession.

Some may ask, quite logically, why this concentra-

tion and consecration on things of the past? Would it not be better in these worried times to devote our thought and energy to the pressing problems of today and tomorrow? The answer, of course, is that we should do both. We cannot afford to waste time in idle reminiscing about the "good old days" when society meetings were small and intimate, friendly and inspiring. We should not mourn too much the passing of great chemical giants of the past—Chandler, Remsen, Baekeland, Edgar Fahs Smith, William Albert Noyes, Sr. Rather, it is our opportunity to reflect on the bearing that all these men and their colleagues had on America's present and future. Our scientific and technical societies are the agencies through which we work as our profession and industries grow in strength and stature. They in turn must grow in size and influence to meet the burgeoning needs of the nation.

Chemical engineering is but a lusty youngster compared with the mother science of chemistry.

The American Institute of Chemical Engineers must wait until 1958 to celebrate its golden anniversary. The Electrochemical Society, founded as was this magazine in 1902, will have its fiftieth birthday next year. But all of us have an important part to play in the international chemical conclave. There will be many visitors from abroad whom we shall want to entertain and inform. The ECA and the Ford Foundation are financing study tours for three hundred young foreign chemists who will visit American university, governmental and industrial laboratories, plants and installations. It is hoped that they will carry back to their homes a better understanding of our chemical progress and the extent to which our industries are dependent upon scientific research and engineering development.

Each of us as individuals owes a debt to the profession of which we are a part. We can make a substantial payment next month if we do our share in making the World Chemical Conclave a great milestone in the history of chemistry in America.

Sidney D. Kirkpatrick

The Trona Process...

We suggest you study the following examples of process ingenuity for variations that may be applicable to your operations.

For instance, you may be able to cool by direct expansion of ammonia, and cut costs three ways in doing so.

J. V. HIGHTOWER

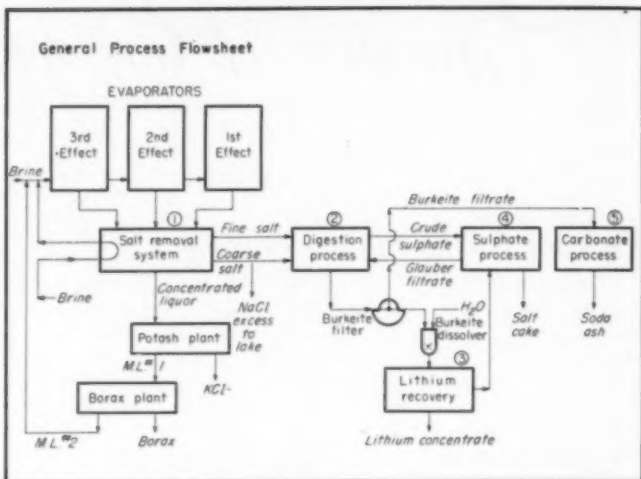
The plant of American Potash & Chemical Corp. at Trona, Calif., operates on brine from the porous salt body of Searles Lake. Brine is pumped from wells and concentrated in triple-effect evaporators, with cycled mother liquors.

During evaporation, sodium chloride and burkeite (sodium carbonate-sulphate double salt), with a small amount of lithium-sodium phosphate, separate from the liquor and are classified in a continuous salt removal system (1). The fines, mainly burkeite and entrained lithium values, are sent to the digestion process (2), and leached free of sodium chloride. The filtered burkeite is dissolved in water, while lithium-sodium phosphate remains in suspension and is removed by froth flotation as lithium concentrate (3).

The clarified burkeite liquor is sent to the sulphate process (4) and cooled to crystallize sodium sulphate as Glauber's salt. The latter is converted to anhydrous by a unique method.

The Glauber's filtrate is returned to the digestion process (2) where the residual sulphate content is reduced by dissolving sodium chloride

J. V. HIGHTOWER, formerly West Coast Editor for Chemical Engineering, is now with the Ralph M. Parsons Co. in Washington, D. C. His first article about operations at Trona described the new carbonation technique applied to Searles Lake lower brine, and appeared in the May issue.



to precipitate burkeite. The resulting liquor is sent to the carbonate process (5) where it is cooled to separate sodium chloride, then sal soda. The latter is recrystallized as sodium carbonate monohydrate, which is dried to finished soda ash.

The hot concentrated liquor from the main evaporators is cooled rapidly in the potash plant to crystallize KCl , which is separated as agricultural grade KCl .

Mother liquor from the primary KCl crystallization is further cooled to crystallize crude borax, and returned to the evaporators, completing the main cycle. The crude borax is refined for market.

(1) TRIPLE-DECK SALT TRAP

The continuous salt removal system consists essentially of a triple deck cone settler through which liquor with salts in suspension is circulated from each effect of the evaporator unit. The coarser crystals, mostly sodium chloride, settling from first effect liquor in the top cone, drop through into the lower cones to be counter-washed by the less concentrated liquors therein and to mix with the crystals settling from these liquors. In the same way the salts from the second effect liquor (circulating through the middle cone) settle and are counter-washed with the liquor from the third effect in the lower cone.

The settled salts are finally discharged to a filter from which the

cake is repulped and then further counter-washed and classified in a hydraulic classifier. The fine salts overflowing the classifier are settled and again filtered. This filter cake, composed mainly of burkeite with some $NaCl$, is sent to the digestion process (2).

The fine salts, mainly burkeite and the lithium compound which do not settle in the salt trap, are carried forward through the evaporator unit and salt trap to the clarifier cone to be separated from the final concentrated liquor. These salts are filtered and sent directly to the digestion process (2). Filtrates from the salt removal system return to the evaporators.

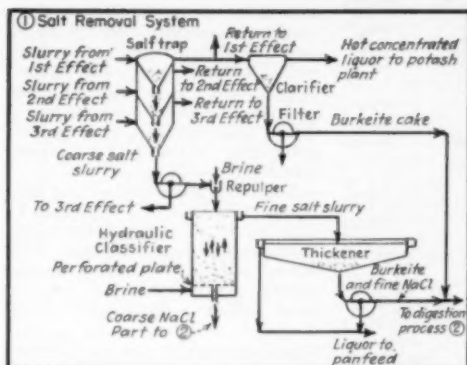
(2) PRECIPITATION OF Na_2SO_4

Glauber's salt filtrate from the sulphate process (4) is treated with solid sodium chloride from (1). This precipitates a considerable portion of the remaining sodium sulphate content of the liquor in the form of anhydrous Na_2SO_4 , although burkeite would be expected to form since it is the stable solid phase indicated by phase rule studies. However, burkeite tends to remain supersaturated at this point in the process and the metastable phase Na_2SO_4 can be separated and recovered relatively free of carbonate.

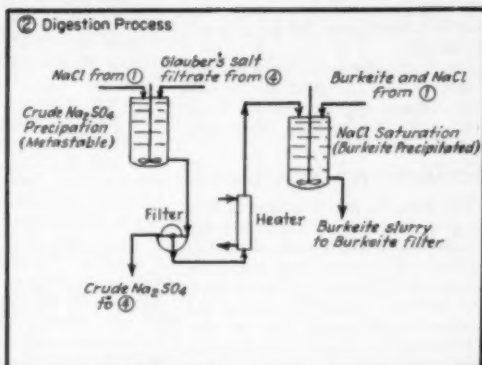
This separation can be carried only so far. The liquor is then heated to about 158 deg. F. and more $NaCl$ is added to the point of saturation which causes burkeite to precipitate.

(Continued)

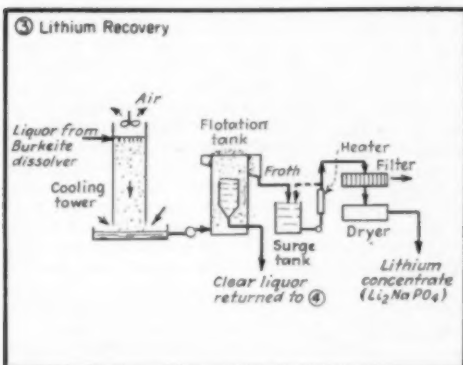
...and its Unique Features



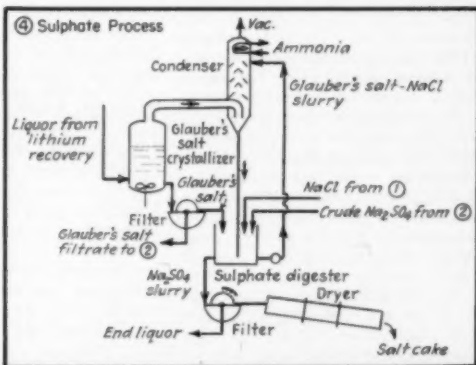
(1) **TRIPLE DECK SALT TRAP** for counter-washing evaporator tail salts. Also separation of burkeite by hydralic classification.



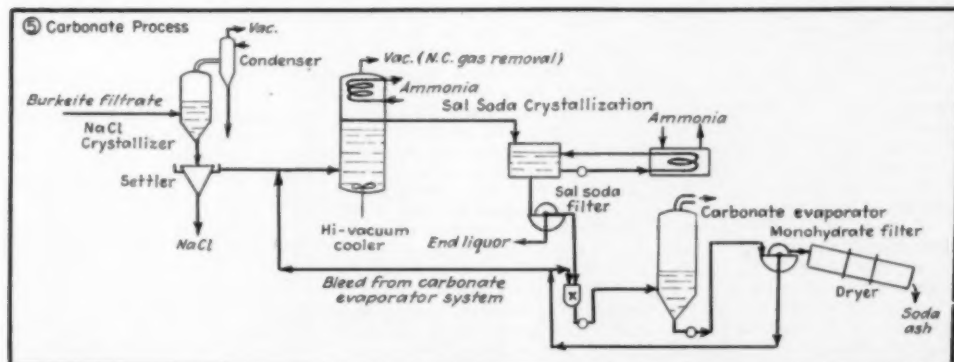
(2) PRECIPITATION of Na_2SO_4 as a metastable solid phase from burkeite solution by rapid addition of NaCl .



(3) **FLOTATION** method of clarifying a liquor and concentrating a slime which is too dilute, fine, and slimy to be filtered.



(4) **CHEMICAL REGENERATIVE REFRIGERATION cycle** for crystallization of Glauber's salt and conversion to anhydrous.



(5) **DIRECT EXPANSION OF AMMONIA** in condensers, coolers, etc. means less equipment required, no brine corrosion problems, and more economical compressor operation. Vacuum is also used for cooling, particularly where salts are being deposited.

This step serves a double purpose since, in addition to producing a liquor high in carbonate and low in sulphate, it also acts as a leach for removing solid NaCl from the burkeite coming from the salt removal system (1).

The metastably precipitated Na_2SO_4 is sent as crude product to the sulphate process (4) for further treatment, while the burkeite slurry goes to the burkeite filter.

(3) CLARIFICATION BY FLOTATION

The flotation step is unique in that the pulp feed is very dilute and the particle size of the floated product is less than 2.5 microns. It is essentially a liquor clarification step. Direct filtration, however, would be out of the question economically due to the large volume of liquor to be handled (600 gpm. average) and the slimy nature of the suspended matter to be removed.

The cake from the burkeite filter consists of a mixture of burkeite precipitate in the second stage of the digestion process (2) and burkeite coming through as fine salt from the salt removal system (1). The latter fraction, which was originally formed in the evaporators, occludes a considerable proportion of the coprecipitated lithium-sodium phosphate. Upon adding water at the burkeite dissolver, the burkeite dissolves rapidly to give a carbonate-sulphate solution of high concentration, but the lithium compound, having a very slow rate of solution, remains mainly as a turbidity in the burkeite liquor. The total lithium content of the mixture at this point is only about 0.05 percent Li_2O .

The liquor is cooled in an induced draft cooling tower where it becomes highly aerated. It passes through a centrifugal pump to emulsify the entrained air and then into a flotation tank where it becomes relatively quiescent. This permits the finely divided entrained air to coalesce and rise to the surface as a froth, carrying the suspended particles of lithium compound with it. This flotation step is aided by the presence of traces of soap in the burkeite filter cake as a result of the use of coconut oil fatty acid as a foam depressant in the evaporators. A small amount of kerosene or stove oil is added at the burkeite dissolver as a modifier so that the froth, after overflowing the flotation tank, will break down easily in the launder and permit the lithium slurry to flow to a surge tank.

From the surge tank the slurry is heated, filtered on a pressure filter, and dried ready for market as a lithium concentrate up to 21 percent Li_2O .

(4) CHEMICAL REGENERATIVE REFRIGERATION

The clarified liquor from the lithium recovery (3) is sent to the Glauber's salt crystallizer where it is cooled by vacuum to about 72 deg. F. The crystals are filtered off and the filtrate (high in Na_2CO_3) is returned to the digestion process (2) for treatment with NaCl as described. The Glauber's salt filter cake is repulped in a digester tank into which solid NaCl from (1) is also fed. This forms a heavy slurry of Glauber's salt in a saturated NaCl solution. The temperature of this mixture drops to that of the transition point of $\text{Na}_2\text{SO}_4 \cdot 10\text{H}_2\text{O} \rightleftharpoons \text{Na}_2\text{SO}_4$, which, in such a solution, is about 64 deg. F. This is cold enough to permit its use as the condensing medium in a barometric condenser on the vapor line from the Glauber's salt crystallizer. The condensation of water vapor into the slurry in the condenser melts the Glauber's salt and the solid sodium chloride is dissolved, while anhydrous Na_2SO_4 is precipitated.

The crude Na_2SO_4 from the digestion process (2) is added to the digester for convenience in recovery.

The cooling needed to crystallize the Glauber's salt in the crystallizer is recovered by the melting of the Glauber's salt in the condenser. Thus, the arrangement constitutes a chemical regenerative refrigeration system. Only a relatively small amount of ammonia refrigeration is needed to start the system and to make up for heat pick-up from the surroundings during continuous operation. At the same time the difficult problem of dehydrating Glauber's salt directly is avoided.

(5) DIRECT EXPANSION OF AMMONIA

The filtrate from the burkeite filter, consisting essentially of a saturated sodium chloride solution high in Na_2CO_3 but low in Na_2SO_4 , is cooled by vacuum to about 86 deg. F. for the crystallization of a small amount of NaCl which is removed by settling. The liquor is then diluted slightly with a small amount of liquor bled from the carbonate evaporator system further along in the process. This prevents further crystallization of NaCl on continued cooling to 38 deg. F. for the crystallization of sal soda. This cooling is done in two main steps. First, it is cooled by vacuum to about 50 deg. F. in a crystallizer containing an ammonia coil in the upper part of the vapor space.* Part of the sal soda crystallizes at this temperature, but the cooling and crystallization is completed in the next step in which the slurry

is circulated through tubes surrounded directly with liquid ammonia. The direct expansion of ammonia into the cooler shell and into the condenser coils of the vacuum crystallizer offers considerable economy over the use of an intermediate refrigeration medium such as a chloride brine. The amount of equipment is greatly reduced, brine corrosion problems are avoided and a higher ammonia back pressure permits more economical compressor operation.

The sal soda is filtered off and converted to the monohydrate ($\text{Na}_2\text{CO}_3 \cdot \text{H}_2\text{O}$) in an evaporator system using steam as the source of heat. The filtered monohydrate is dried to commercial, granular soda ash, while a small portion of the recycled filtrate is used for dilution of the vacuum crystallizer feed as mentioned above. This also keeps the evaporator cycle bled of impurities.

POTASH AND BORAX PLANT

Chief among the unique features of the potash and borax plants are:

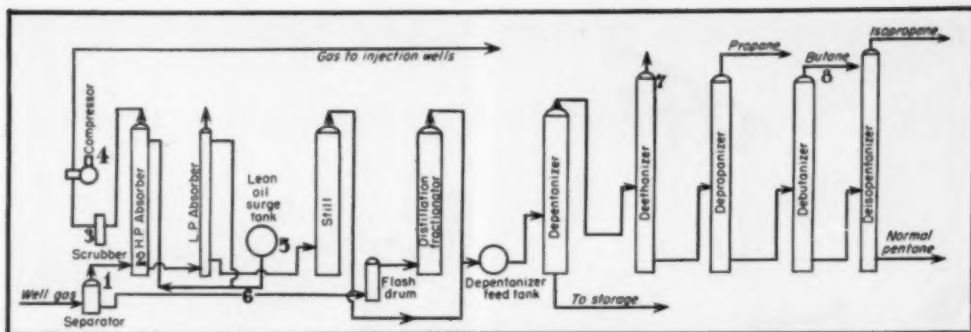
1. Rapid cooling of the hot concentrated liquor for the crystallization and separation of KCl, while the borax remains in the liquor in a supersaturated condition to be recovered in the next step.

2. Use of a saturated brine (low vapor pressure) as a condensing medium in a barometric type condenser serving the last stage of potash cooling to get a higher vacuum (and thus a lower temperature) in the cooler. This same factor is also present in the Glauber's salt regenerative refrigeration system, (4) above.

3. Use of direct expansion of ammonia in the condenser heads in the crude borax crystallizers (similar in construction to the sal soda vacuum cooler shown in (5) above). However, these are not followed by a surface cooler, as in the case of the sal soda, as cooling is not carried much below 78-80 deg. F.).

4. Fusion of borax on a sloping bed of solid borax for the production of anhydrous borax, thus avoiding possible contamination of the product due to the extreme fluxing action of molten borax on refractories and other conventional materials.

* Vacuum is used for cooling of liquors wherever possible, particularly where salts are being deposited. In such an operation, heat transfer from the liquor occurs at the liquid-vapor interface with no solid wall present upon which crystals can build up and interfere with the rate of heat transfer. Naturally, however, vacuum cooling with an ammonia condenser cannot be carried beyond the point where ice would form on the condensing surface. This would be the case in the final cooling step of the sal soda crystallization. Therefore, a direct surface cooler (shell and tube type) is used in series with the vacuum cooler as shown.



$$D = P/S$$

Danger increases with pressure. When pressure rises you need more safety measures to cut danger. Here's how the Texas Co. increased that S factor at the new cycling plant.

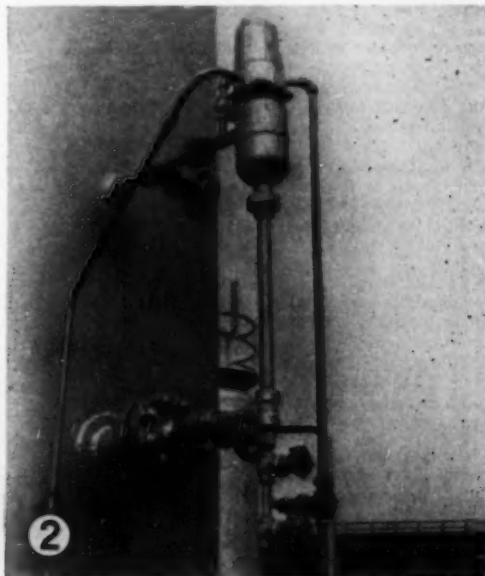
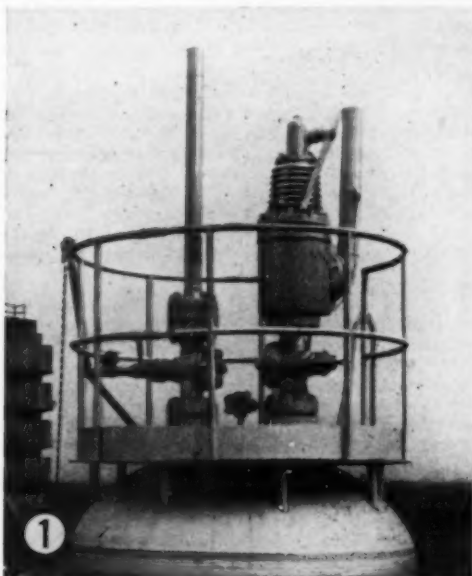
JAMES A. LEE

Pressures of 1,900 psi. and 4,600 psi. used in the cycling plant operated by the Texas Co. at Erath, La., call for specially designed equipment and techniques for handling them and for many safety devices.

The plant takes gas from producing wells, reduces the pressure, separates condensates, strips it of desirable hydro-

carbons in an absorption unit, recompresses the dry gas and returns it to injection wells for some future use.

1. Incoming gas from the wells enters the plant through a gathering system. It flows into a cooling tower where the temperature is reduced from 120 to 100 deg. F. Regulators reduce the pressure from 2,200 psi. to 1,900 psi. Gas then passes to two 5 ft. x 18 ft., 1,900 psi. separators where condensate and gas are separated. These towers have a wall thickness of 4 1/8 in. and are multilayer construction. Each tower is equipped with a safety valve and a safety





bursting head. The latter device is necessary inasmuch as a safety valve will freeze easily under high pressure. The valve stem is steam jacketed. All high pressure 10-in. steel piping has a wall thickness of 1.125 in.

2. Gas that is removed from the condensate in the separators passes into pressure absorbers operating at 1,900 psi. Each absorber has two safety valves. Here the remaining hydrocarbons are absorbed and go to the stills. The dry gas passes to a 1,900 psi. compression suction scrubber which removes any liquid carryover from the high-pressure absorbers. These scrubbers have a total shell thickness of 3 1/4 in., comprised of an inner layer of 1/2-in. plate and 14 outer layers of 4-in. plate with a maximum working pressure of 2,000 psi. The scrubber has a safety valve. (Safety control for the signal is shown on the side of the scrubber.)

3. Gas from which desirable hydrocarbons have been removed flows from the top of the absorbers through scrubbers to remove oil entrainment and then through compressors. Separators, absorbers, and scrubbers designed for 2,000 psi. are laminated steel plate construction, about 4 in. total thickness. The scrubbers are equipped with a high-level alarm system consisting of red lights and horn.

4. After gas has been stripped it is compressed. The compressors were designed for discharging gas to the input wells at 5,000 psi. but are being operated at 4,600 psi. Several miles of 6 1/2-in. O.D. by 0.864-in. wall thickness high-tensile carbon steel pipe is used to carry the gas to the wells. Each line from the compressors is protected by two bursting disks that will rupture at 6,000 psi. All high-



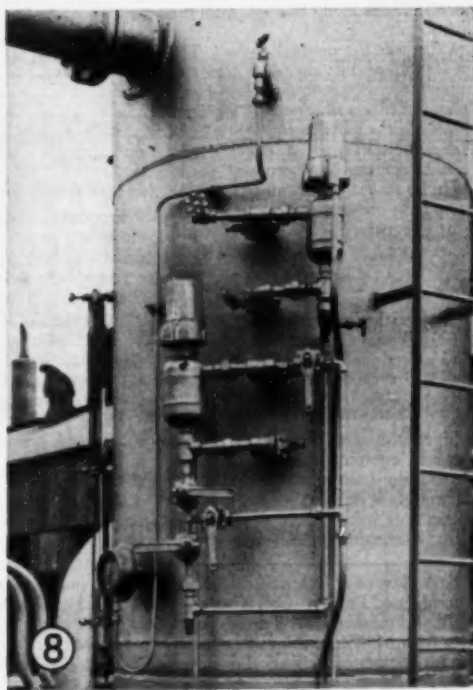
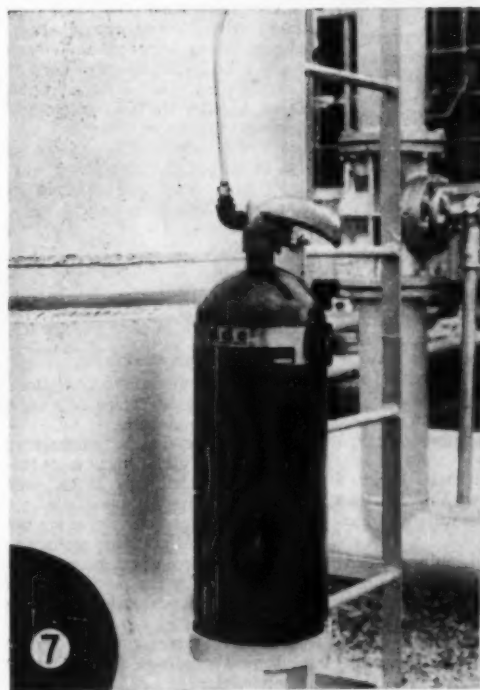
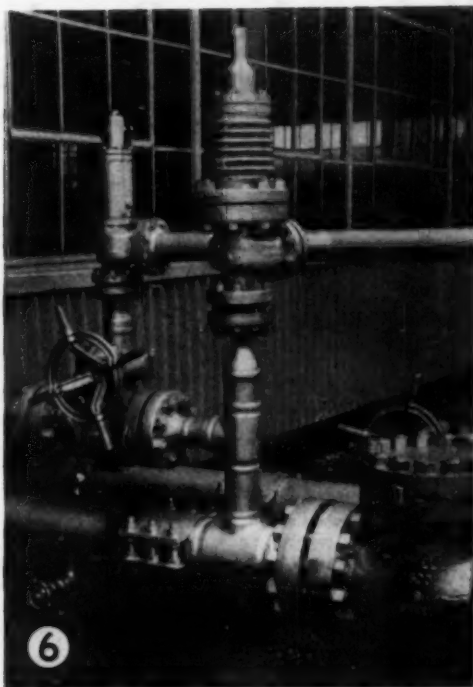
pressure relief and control valves have been installed on the outside of the buildings.

5. Cold lean oil used in the absorbers is stored in the horizontal surge tank shown here. Every vessel handling both liquid and gas in the plant is equipped with a safety valve relief a pipeline running to the flare.

6. Absorption lean oil is pumped to the absorbers at 2,000 psi. The line from the pump house is equipped with two safety valves and one check valve. If the discharge is closed the valve will relieve itself back into the pump suction. Also, it has a safety valve on the suction line so that if the suction valve is closed the other safety valve will relieve itself back into the storage tank. The check valve prevents the high-pressure gas from the absorbers entering the lean oil surge tank through the pump.

7. Gases from relief valves on top of all towers are apt to be ignited during electrical storms. Such fires can be put out quickly by an operator at the base of the tower. A CO₂ bottle is fastened to the side of the tower two or three ft. above the ground. A tube from the bottle runs to the top of the tower where it is tied into the relief valve discharge. When the gas catches fire from lightning the operator can turn on the CO₂ and snuff out the fire.

8. Refrigeration suction scrubber on the product flash tank is equipped with an automatic shut down. In case the level in the vessel gets to a dangerous point the safety control shown on the side of the tower closes down the compressor and operates a red light and horn.



Before You Buy Used Equipment—

Check the following for tips which will aid in your selection. You will probably be buying more used equipment now.

S. A. SAVITT

While authentic figures on surplus equipment sales are not available, a conservative estimate would be several hundred million dollars annually representing 15-20 percent of the sales volume of new equipment.

Thus we see that reconditioned and rebuilt equipment constitute a vital force in our industrial production that becomes even more important with the decreasing availability of new equipment.

Here are some of the things you should consider before applying used equipment to your operations.

GENERAL CONSIDERATIONS

Answers to the following will help you evaluate the suitability of a piece of equipment:

What was the equipment used for previously? It is more likely to be in good condition if it was used for the purpose it was designed for. Little-used modern equipment sold in toto as an operating plant is frequently made available due to the high rate of process obsolescence in the chemical industry.

Who was the original owner? The reputation of the chemical company using the equipment before you will be an indication of the care it received.

Who is the manufacturer? Similarly, the reputation of the manufacturer should be taken into account.

Under what conditions was the equipment operated? Here you would want to consider:

- (1) Nature of chemicals used. Were they liquid or solid? How corrosive to the particular material of construction?
- (2) Temperature and pressure.
- (3) Production rate.
- (4) Operated in the open?

ALLOY COMPOSITIONS

Since the alloy composition of a piece of equipment is not generally identifiable from the nameplates or stampings, it is usually necessary to obtain this information when equipment is intended for corrosive service.

S. A. SAVITT is technical director of Consolidated Products Co., New York, N. Y. Formerly he was a process engineer with M. W. Kellogg after receiving his doctorate in chemical engineering from Brooklyn Poly.

Sources for determining alloy compositions are:

1. The previous owner. He probably has available a copy of the original invoice or a blueprint on which the alloy composition will be marked.
2. The manufacturer. He will supply this information if you give him the serial number.
3. Simple tests. The use of a magnet and a small bottle of nitric or hydrochloric acid will help to determine whether the metal is steel, stainless steel, nickel, or Monel. Both steel and nickel are magnetic—which is which can usually be determined by the presence or absence of rust. Monel can be distinguished from stainless by adding a drop or two of HNO_3 or HCl to knife scrapings. This test gives a greenish precipitate with either Monel or nickel, and no reaction with stainless. Aluminum and copper and its alloys can be determined by visual inspection.

These tests are of course only good for rough classifications. More frequently you will want to know the exact composition. If this cannot be determined to your satisfaction from the blueprints, the original invoice, or the serial number, a sample piece of metal from the equipment may be sent to an independent testing laboratory for analysis.

ADAPTING TO PROCESS

Frequently changes will have to be made in a piece of used equipment to make it suitable for the particular process, and the cost of making these changes should not be overlooked.

For example, tanks and kettles may be lined with glass, rubber, stainless steel, etc. Jackets and coils may be added, type of agitation modified and openings re-located.

Filter press skeletons can be purchased and provided with the desired number of plates and frames or suitable material and thickness. Location of feed and type of washing can thus be modified to suit the particular operation.

A standard piece of equipment used in one industry can be used readily or more adaptable for another. For example, a single or double effect evaporator used in the food industry can be used in the heavy chemical, pharmaceutical, or drug industry.

VISUAL INSPECTION

Your estimate of the condition of a piece of used equipment will depend largely on visual inspection.

Engineers responsible for selecting used equipment should provide themselves with the following:

- | | |
|----------------|----------------|
| 1. Magnet | 6. Steel brush |
| 2. 6-ft. rule | 7. Rags |
| 3. Knife | 8. Old clothes |
| 4. Flashlight | 9. Gloves |
| 5. Emery paper | |

PRICE

Under normal conditions of supply and demand, used equipment generally runs about 50 percent of the new purchase price.

Today this average is up to about 60 percent, with little-used modern equipment selling considerably higher than the average price. Savings accruing from immediate delivery are a large factor in making purchases of little-used modern equipment economically feasible.

Frequently auxiliaries such as pumps, valves, instruments, controls, and pipe that go with used equipment bought as an operating unit represent a sizable plus. This is because the amount added to the price of the used equipment because of these auxiliaries is quite small compared to what would have to be paid for these same auxiliaries new. Auxiliaries represent in some cases 20-30 percent of the major equipment costs.

The final decision as to whether to buy used or new equipment revolves around the respective qualifications and the savings from buying used equipment, both in time and money.

AVAILABILITY AND GUARANTEE

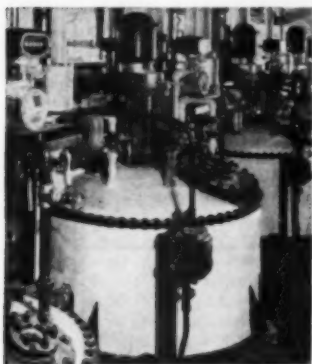
Aside from the economic factors, the outstanding advantage of rebuilt equipment is availability.

Delivery dates in the purchase of new machinery are in many cases tentative and indefinite. With used equipment, delivery is immediate.

Used equipment companies are not in a position to guarantee productive capacity of a piece of equipment. This is determined by the purchaser from his past experience and engineering calculations.

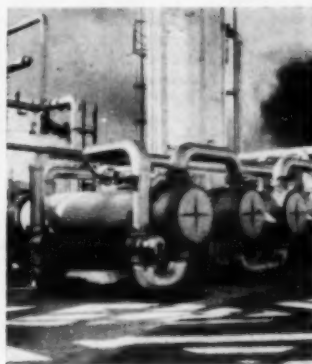
They do, however, guarantee perfect mechanical condition for equipment they rebuild.

Check List for Used Equipment . . .



KETTLES

1. Name of manufacturer.
2. Capacity in gallons.
3. Material of construction and thickness of shell and jacket.
4. Closed or open top kettle, dished or flat heads.
5. What is jacket pressure?
6. Agitation: single or double motion; paddle, turbine, or propeller type; speed.
7. Bottom outlet and other openings.
8. Power transmission and motor.



HEAT EXCHANGERS

1. Material of construction of tubes, tube sheets, and shell.
2. Square feet of heating surface in the exchanger.
3. Diameter and length of the heat exchanger shell.
4. Number, size, and length of tubes.
5. How many passes in the tubes and the shell?
6. Details of internal construction.
7. Size and number of openings in the heat exchanger shell.

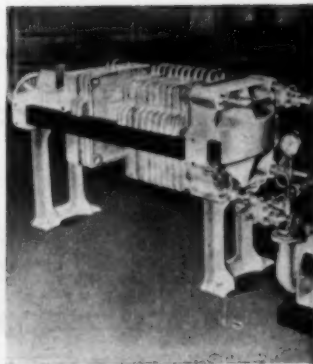
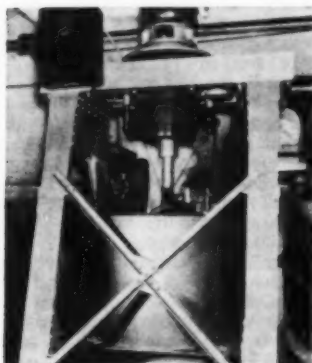


PLATE & FRAME FILTER PRESSES

1. Name of manufacturer.
2. Dimensions of plates and frames, and number.
3. What type of feed? Side, center, or corner?
4. Open or closed delivery.
5. Washing or non-washing type.
6. How many chambers are there in the filter press?
7. Thickness of cake made.
8. Material of construction of plates and frames.



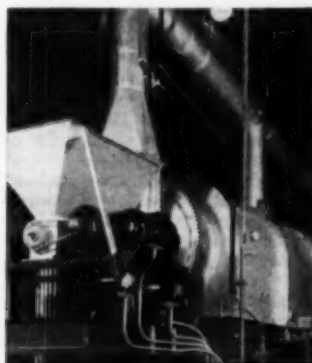
CENTRIFUGAL MACHINES

1. Manufacturer's name.
2. Over or under-driven.
3. Diameter and depth of basket.
4. Basket and curb material?
5. Belt, motor, or other drive?
6. Size and electrical characteristics of motor.
7. Speed of basket.
8. Equipped with unloaders?
9. Top, bottom, or other discharge.
10. Self-balancing, suspended, or center-slung?



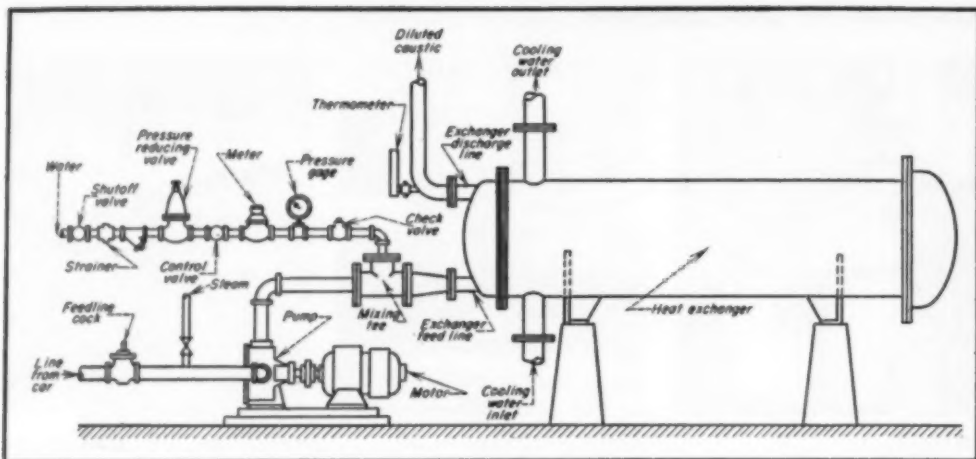
FRACTIONATING COLUMNS

1. Diameter and height of the fractionating column.
2. Material of construction and thickness of shell.
3. Is the column a packed column or bubble cap type?
4. Number of plates or trays.
5. Is column complete with reboiler, pre-heater, and condenser?
6. Batch or continuous?
7. Details of accessories such as heat exchangers, instruments, pumps, etc.



ROTARY DRYERS

1. Manufacturer's name.
2. Inside diameter and length of the dryer shell.
3. Is the dryer a single or double shell rotary dryer?
4. Direct or indirect heat.
5. Type of drive.
6. Size and electrical characteristics of motor.
7. Details of accessories.
8. Material of construction and thickness of shell.



Here is the equipment you need to handle 73 percent caustic in your plant.

How to Handle Liquid Caustic

Liquid caustic soda flows to a host of industries. Here is an authority's views on how to make it serve your plant best at the lowest possible cost. Key: Balance dilution cost and freight.

R. A. SPRINGER

The word "liquid" as applied to commercial liquid caustic soda is technically a misnomer. However, it has been widely accepted by industry as denoting a concentrated water solution of caustic soda. This term separates solution forms from solid or anhydrous forms.

Liquid caustic soda is manufactured and shipped by all major producers in two concentrations. These are identified as 50 and 73 percent with the percentages representing the approximate sodium hydroxide content on a weight basis. Although they differ only in their water to caustic ratios, their physical characteristics are quite different. Enthalpy, freezing point, and boiling point are a few of the important properties that must be carefully considered. These are different for each solution form and necessitate certain variations in methods of unloading, handling and storage.

Relatively small quantities of liquid caustic soda are utilized by industry

in the concentrated form as received from the manufacturer. The concentrated product is diluted and because of the very nature of caustic soda solutions, the dilution problems are multifarious.

Principal means of transporting liquid caustic soda is the tank car. A common practice is to ship it in either 8,000 or 10,000 gal. quantities. Recently, however, smaller amounts of 50 percent liquid are being transported by tank truck for use by industries located near the producers.

50 PERCENT CAUSTIC

The 50 percent caustic soda is used most commonly. Commercially, this strength may vary between 48 and 51 percent. It has a freezing or solidifying point temperature range of 49 to 58 deg. F. From an operational standpoint, it is practical to maintain solution temperatures considerably above this range. This is due to the high viscosity of 50 percent liquor as the temperature approaches the freezing point. A recommended minimum temperature for a solution of this strength is 85 deg. F. At this temperature the viscosity is no more than 25 to 30 cp. Then the caustic can

be transferred by standard and inexpensively equipped pumps.

In order to transfer 50 percent caustic by the most economical means, pipelines should be at least 2-in. dia. and 3-in. lines on the suction side of pumps are recommended. A consideration of the resistance to flow in a pipe for 50 percent liquor at 85 deg. F. will bear this out. At a flow-rate of 100 gpm. the friction loss in head per 100 ft. of 3-in. pipe is about 5 ft. Under the same conditions the loss in head for a 2-in. pipe is more than 35 ft. Because of frictional losses in pipelines, use of two 45 deg. fittings is preferable to one 90 deg. elbow. This is particularly important where a long suction line to a pump is involved.

Through experience, piping equipped with flanged connections has been found to be most practical. With flanges welded to the lengths of pipe and other fittings and with alkali-resistant gaskets between the flanges, leaks will be held to a minimum. Maintenance labor costs are reduced because of the comparative ease with which replacements can be made. It is also a simple matter to remove sections for clean-outs.

To make drainage from lines com-

R. A. SPRINGER is in the technical service division, Diamond Alkali Co., Painesville, Ohio. This article is based on the paper he presented to the annual meeting of TAPPI.

plete after use, all piping should be installed with a slight slope. Avoid loops or pockets. These precautions will cut maintenance costs by preventing frozen lines during cold weather.

To control rates of flow and for line shutoffs, the standard lubricated plug cock has been found to be most suitable. It gives very economical service. Various types of valves are commonly employed, however, in caustic and caustic dilution systems; the less elaborate fittings appear to be the most satisfactory. Construction details should call for a sufficient number of steam connection fittings on all piping arrangements. This makes it possible to enforce the cardinal rule of steaming out all caustic lines both before and after use.

Either the open impeller centrifugal or rotary positive displacement pump may be used. Installation of either type of pump should include a bypass or circulating line arrangement. This reduces wear on the pump and in many cases can be used as a means for controlling rate of flow. Location of a pump in a caustic soda system should receive careful consideration. For ease of operation the suction line must be as short as possible.

Storage facilities for 50 percent liquid caustic soda must have capacity to accommodate a 10,000-gal. shipment. Provision must be made for a reserve supply of caustic soda between shipments. Practically, it is suggested that total storage space be at least double the tank car capacity of 20,000 gal.

Extra heavy metal is preferred in the construction of caustic soda storage tanks. Specifications for fabrication should call for at least $\frac{1}{2}$ -in. wall thickness on the body of units larger than 10,000 gal. capacity. The pipe connection for withdrawing the liquor from storage should be located a few inches above the bottom of the tank. A drain connection at the lowest point of the tank also should be included to facilitate flushing.

It is desirable to place 50 percent liquid caustic soda storage tanks in a heated building that is maintained above 60 F. This will usually insure a storage temperature of 85 F. or higher which is optimum for handling the liquor. Outside must be supplied with a source of heat. A small coil or loop of 1 to 1 $\frac{1}{2}$ -in. pipe connected to a source of low-pressure steam, 12 to 15 psi., is adequate. For the average mill, automatic controls on the steam supply are not warranted. Best practice is to warm the liquor intermittently as the occasion demands. With a temperature range of 85 to 140 deg. F. little attention is required. Avoid storage temperatures above 140 deg. F. Caustic soda is more corrosive to steel above this point. Insulation of tanks although desirable is not necessarily a requirement. The most economical thickness for common types of insulation is 2 in.

MATERIALS OF CONSTRUCTION

Usual materials of construction for a caustic soda system are steel and iron. Flange quality steel is preferred for tanks. Black iron, carbon steel, and cast iron are the best materials for pipes and fittings. Cast iron pumps work well although longer service can be expected from nickel or some of the nickel alloys. A very small amount of iron contamination will occur in systems of all-iron construction. If this is objectionable, nickel may be substituted. Nickel-clad steel, various alloys, and organic coatings are also used.

Dilution of 50 percent liquid caustic soda to any desired concentration presents very few difficulties provided the method for handling the original 50 percent liquor is mastered. Pumps, pipelines, tanks, and other equipment previously discussed are at least adequate for lower concentrations.

Usual practice is to dilute to either 20 or 30 percent. This furnishes a solution that is much less corrosive and less hazardous to handle. The freezing point is lowered from 54

Dilution of Commercial 50-Percent Liquid Caustic Soda

Diluted Conc. NaOH, Percent	Volume of Dilution Water, Gal.	Volume of Solution at Av. Max. Temp., Gal.	Deg. F. Dilution Water; Max. Temp., Deg. F.	Deg. F. Dilution Water; Max. Temp., Deg. F.
45	27	184	130	134
40	60	214	144	151
35	103	254	145	156
30	160	308	143	155
25	240	385	131	147
20	340	500	119	139
15	540	698	100	134
10	940	1,091	83	109
5	2,180	2,383	65	94

Values based on 1 ton gross weight (1 ton anhydrous weight) of 50 percent liquid caustic soda at 110 deg. F. (Approx. 160 gal.)

deg. F. for 50 percent liquor to 34 deg. F. for 30 percent, and -15 deg. F. for 20 percent. Much of the danger of the solution solidifying in pipelines and other equipment is removed. A disadvantage of handling the diluted forms is the increase in storage capacity that is required. Cost of additional tanks must be weighed against the increased operational expenses that are inherent in the 50 percent systems.

Dilution of 50 percent liquid caustic soda is a problem that confronts most industries. The accompanying table has been prepared to present a few of the factors that must be considered when dilution of 50 percent caustic soda liquor is effected. Calculations for the values represented in the table were based on 1 ton of 50 percent liquid caustic soda (1,000 lb. NaOH) at a temperature of 110 deg. F. This condition was chosen because it is an approximate average temperature at which 50 percent liquor will be received by the consumer. The volume of water required per ton for each dilution is listed. From a practical standpoint the dilution water temperature does not greatly affect the dilution water volume and hence these volumes were calculated at 60 F. The dilution water temperature does, however, influence the maximum temperature of the diluted solution. Provision was made to list the maximum solution temperature obtained (Continued on page 282)

Factors to Consider in Diluting Commercial 73 Percent Liquid Caustic Soda*

Diluted Conc. NaOH, Percent	Volume of Dilution Water, Gal.	Volume of Solution at 140 deg. F., Gal.	Temperature of Dilution Water, deg. F.				Heat to Remove to 140 deg. F., Btu.	Heat to Remove to 140 deg. F., Btu.	Heat to Remove to 140 deg. F., Btu.	Heat to Remove to 140 deg. F., Btu.
			50	60	70	80				
			Max. Temp., deg. F.	Max. Temp., deg. F.	Max. Temp., deg. F.	Max. Temp., deg. F.				
60	52	183	147	179,010	248	183,840	187,670	252	192,000	
55	73	205	253	215,900	306	225,450	290,000	362	236,550	
50	110	234	258	250,730	390	268,920	364	278,120	368	287,320
45	149	269	255	295,810	260	308,230	265	320,670	271†	333,110
40	198	313	249	333,450	255	349,950	261†	365,430	268†	382,960
35	260	370	237	340,270	243	361,980	249†	385,600	255†	405,40†
30	344	449	219	334,640	238	363,310	233	391,980	240†	420,650
25	461	561	193	274,320	201	312,720	209	331,120	218	346,620
20	636	732	180	182,300	177	228,800	186	269,800	194	281,820
15	928	1022	138	-25,460	148	81,980	154	129,520	165	204,550
10	1311	1814	108	-429,400	117	-303,400	126	-177,400	135	-81,400
5	3263	3390	77	-1,748,000	88	-1,486,000	96	-1,214,000	106	-943,000

* Values based on 1 ton gross weight (1,460 lb. NaOH) of 73 percent liquid caustic soda at 210 deg. F. (Equivalent to approximately 160 gal.) † Near or above the boiling point.



MANAGEMENT of the present atomic regime is businesslike. From the left, Thomas Murray, electrical manufacturer, holder of some 200 patents, has been a director of Chrysler Corp. Sumner Pike is an empiricist with a penetrating mind. He made a moderate fortune promoting and financing mining enterprises, went into government with SEC. Gordon Dean, Chairman, is a practicing lawyer with a working knowledge of politics. He was on the legal staff of the Justice Dept., helped prosecute war criminals in Germany. T. Keith Glennan is an engineer with a curiously mixed business history as executive of Western Electric, Paramount Pictures, Goldwyn Studios and Ansco. For three years before his appointment, he was president of Case Institute. Henry D. Smyth, author of the famous Smyth Report, has been, for many years, chairman of the Princeton Physics Department. Marion W. Boyer was vice president and director of Esso Standard.



RADIOISOTOPES, the location of medical and scientific institutions using them, is shown by pins in a map of the U.S. Recently one research group finished a series of laboratory tracer studies on wear and friction by road-testing the wear of radioactive pistons in an automobile. Result: a new lubricating oil.

Another application: the routine use of radioisotopes in an oil products pipeline to run from Utah to Washington. The pipeline is now in operation in Boise, Idaho. A wide variety of products is pumped through the line, including several different types and grades of gasoline, diesel oil, and stove oil. Radioactive antimony marks the boundaries between the various products.

A new industrial application is the use of radioactive strontium in studying the movement of preservatives in telephone poles. The radioisotope is compounded with the impregnants, later takes its own picture on a photographic film.



REACTORS, key to research and development of atomic power, are typified by the Brookhaven reactor (west face shown). This reactor is the nucleus of the Brookhaven National Laboratory, a basic research center on Long Island operated by Associated Universities Inc., a New York corporation formed by nine leading northeastern educational institutions. Other major research facilities include: (1) The University of Chicago, which operates the Argonne National Laboratory, a research and reactor development center in Illinois. (2) Carbide and Carbon which operates the Oak Ridge National Laboratory, a basic and applied research center in Tennessee. (3) The University of California which operates the weapons research center at Los Alamos, New Mexico, and the Berkeley Radiation Laboratory, a basic research center on the west coast. (4) The Sandia Corp. a subsidiary of Western Electric, operates the Sandia Laboratory at Albuquerque, coordinates AEC with armed forces.



ENIWEТОK, the 1951 version of the atomic cloud. A more powerful explosion than from previous bombs, demonstrated proof that in . . .

1951: The Atom Is Beginning to Pay Off

- BOMBS:** Output rising rapidly last 18 mo., has probably doubled postwar rate already. Will increase for 4 more years.
- POWER:** Production of useful power from atomic fuels has suddenly become immediate rather than something for the 1960's.
- MANAGERS:** A new, more businesslike team has taken over, is running the program with minimum conflict, lost motion.

ROBERT B. COLBORN

Atomic energy will declare its first dividend in 1951. The \$64 billion atomic establishment topped only by U. S. Steel now knows where it's going and—with much of its trust in chemical titans like Carbide, Du Pont

and GE—it knows how to get there.

To get a clear picture of the program today, we need the perspective of yesterday.

FIRST, PLUTONIUM

That takes us back to 1947—the turning point after the postwar let-down. General Electric rehabilitated the Hanford reactors and by the end of the year AEC was ready to launch a \$500 million plant expansion program.

The expansion program was centered at Hanford, because at that time, Hanford seemed to have the more promising process. Two additional reactors, to transmute uranium into plutonium, were constructed. Also a

new and more efficient chemical plant to extract the plutonium was planned as a substitute for the old.

Work on the two reactors went ahead smoothly; on the chemical plant, it did not. Difficulty was a novel process and one peculiarly difficult to scale up from laboratory to plant. Engineering went slowly; construction started later than planned, will not be finished for several months yet.

A sharp upturn in the output of plutonium began in the spring of 1950. The output of the new reactors, plus the know-how garnered by GE from three years operating experience, was responsible for improved handling, increased output, lower costs.

BOB COLBORN, Assistant Managing Editor of McGraw-Hill's Business Week, has each year since 1947, toured the country's atomic installation. By talking to working-level atomic officials from Hanford to Berkeley from Brookhaven to Savannah, he has come up with what is probably the top yearly roundup of the country's atomic energy program. For a comprehensive atomic report to executives see Business Week for July 28.

This expansion plus increased efficiency would have come to a peak late this year with an output of plutonium perhaps three times Hanford's original capacity. But fighting broke out in Korea.

That resulted in another round of expansion for AEC paced by the President's directive to begin work toward the development of an H-bomb.

So now the biggest feature of AEC's post-Korea expansion is a dual-purpose plant able to make either plutonium or tritium. Tritium is made from lithium in reactors of the same sort which manufacture plutonium from heavy uranium. The plant is being built by Du Pont at Savannah River in South Carolina. It will eventually cost close to a billion dollars, probably begin operation in 1954.

DU PONT DESIGN

Design of the Savannah River reactors is still being worked out, but indications are that they will differ radically from the Hanford reactors. Nowadays most designers favor the heavy-water type of machine. This gives a flexible and convenient piece of equipment. In a huge shielded tank of heavy water, a lattice of natural-uranium slugs can be suspended to manufacture plutonium. The heavy water serves doubly—it replaces carbon as a moderator, slowing the neutrons emitted by splitting atoms; the same water can be circulated through a heat exchanger to dissipate the hundreds of thousands of kilowatts of energy released.

Mechanically, this design has a double advantage. For one thing it eliminates the elaborate equipment needed at Hanford to purify, circulate, store, and finally discharge cooling water from the Columbia River.

A second advantage is that the arrangement of the fuel elements can be changed without rebuilding the whole machine. Thus, if you want to make tritium instead of plutonium, you can fuel the reactor with slugs of uranium enriched in fissionable material, then you insert as much metallic lithium as the reactor can take without choking off the chain reaction. Natural lithium is a mixture of two isotopes, nine parts heavy lithium and one part light. Neutrons ignore the heavy isotope, split the light lithium into helium and tritium.

During the war, when Hanford was designed, Manhattan District people considered using heavy water; but the material was then too scarce, and blocks of carbon were used instead. Now a good supply of heavy water is available from a plant in Canada, and AEC is planning additional capacity.

It's almost certain the Savannah River reactors will be kept cool—below the boiling point of water. This will mean that, as at Hanford, the million or so kilowatts of power produced will be thrown away uselessly in a cooling system.

It would have been nice to use the power, but the need is for weapons quick, and AEC doesn't want to get involved now in the engineering problems of running at high temperature.

GASEOUS DIFFUSION

Right from the start in 1945, the gaseous diffusion process for separating fissionable light uranium, U235, from the far more plentiful U238 was unbelievably successful. The process is simple in principle: A uranium fluorine compound in the form of a hot gas is pumped through coils of porous tubing suspended in a vacuum chamber. The U235 molecules leak through just a little faster than the 238 molecules, so the gas that gets into the vacuum chamber is very slightly richer in fissionable material. Another pump whisks this gas from the chamber, pushes it through more porous tubing. And so on, literally for thousands of stages.

In practice, it's a terribly complicated deal; you have to maintain delicate balances of pressure, temperature, flow quantities, etc. But from the start the huge plant worked well, developing few bugs. Year by year, the Carbide people who operate it have improved the process—achieving moderate increases in output and really startling savings in operating costs.

They have made the controls more and more automatic until today the plant, like a modern refinery, is very nearly a piece of robot apparatus, maintaining its own balances, adjusting automatically to changes in throughput. The work force has been reduced to about a third of the force that originally ran it.

Despite this success, the Oak Ridge plant seemed to the atom administrators, for the first few postwar years, like a sort of lucky freak that would never need to be repeated. Manufacture of plutonium in nuclear reactors looked like the more promising approach, and the AEC concentrated its 1947 expansion plans entirely in this direction.

What changed this view, apparently, was the 1948 Eniwetok Proving Ground test of new and more powerful bomb designs. It seems to have demonstrated a continuing need for U235 as well as plutonium; at any rate, a few months after the tests, AEC announced a \$60 million expansion at Oak Ridge.

A year later, when the Russians startled the world by exploding a bomb of their own, AEC's first response was a further and larger (\$160 million) addition to Oak Ridge.

The first expansion was completed early this year; the second is scheduled to go into operation this coming winter. Together, it appears, they will about double the output of Oak Ridge.

The new equipment is an enlargement of the original plant, not a new plant. Gaseous diffusion is a cascade process. At the input end, big pumps handle large volumes of gas; as the gas moves through the plant, more and more of the U238 is eliminated, and at the output end the pumps have to handle much less than the input volume. One possible way of enlarging a plant like this is by adding on even bigger equipment at the input end; then what used to be the input equipment still handles the same volume of gas—but gas which has been enriched in U235 by the new equipment feeding into it.

Korea was the next big bump. At the same time that it decided on a new Hanford at Savannah River, AEC put in the works a second Oak Ridge at Paducah. Work on the project started last December. The plant will cost about half a billion, will have a capacity about equal to the expanded Oak Ridge works, will probably start operating in the winter of 1952-53.

ATOMIC POWER

As recently as a year ago you had to look hard and long to find serious interest among businessmen in atomic matters.

Today you see signs of a rush to get into the field before the ground floor gets too crowded.

You can find several reasons for this rather sudden shift:

1. The atom program is now getting so big as to involve nearly every technical business at some point or other; in a year's time, AEC places some 11,000 prime purchases and contracts.

2. Rightly or wrongly, many industrialists felt that the old Lillienthal commission was unsympathetic to business; contractors and other businessmen are finding the new group easy to deal with.

3. Within the past year—and this is perhaps the biggest reason of all—useful power from nuclear fission has begun to look like something for the near future.

Emergence of electric power as an early possibility is a sharp reversal. It's true that back in 1946 observers were talking about atomic power plants in five years, but since then power has seemed to move farther

and farther away as research uncovered fresh difficulties. Even a year ago it looked like something for the 1960's. But in the last 12 months, two things have changed the picture: a shift in economic viewpoint; and technical developments coming out of jet engine work, in the application of new metals—titanium and, most recently, zirconium.

Any day now, if not already, scientists from the Argonne National Laboratory will throw the switches on a little machine designed to "burn" U235 which produces plutonium which will burn more U235 until all the uranium has been consumed. Theoretical power output of such a reaction is 10 million kwh. per pound of uranium.

This machine—the Experimental Breeder Reactor at the Arco Proving Ground in Idaho—is designed to produce power via the above reaction on an experimental scale. EBR has cost \$2 million—very cheap as reactors go—and its primary job is to show that a properly designed reactor can produce an amount of plutonium at least equivalent to the U235 it consumes. At the same time it will run hot enough to make steam to drive a generator of something over 1,000 kw.

Despite this demonstration of technical feasibility, the economics are still all against any power plant on this system. In the present state of the art, atomic engineers are sure, it would cost altogether too much. The electricity produced would have to sell for several times commercial rates to carry the investment required.

The costs involved are of a sort which certainly can be brought down by a lot of research and development work. Quite likely they can be brought down enough to be competitive.

But that's a decade or more away.

BYPRODUCT POWER

There's quite a different way of looking at the power question. That is, running the reactors at higher temperatures, letting the cooling water rise to steam temperatures.

Atomic energy officials gave serious thought last fall to having the Savannah River reactors designed for a temperature high enough to make their energy output usable. The deciding factor against this was time: the military planners wanted the plutonium (or tritium) and wanted it yesterday; the designers figured it would take them an extra 18 months to solve the structural and mechanical difficulties of steam-engine temperatures.

On that basis, AEC programmed itself to the odd situation it will find itself in a year or so from now: with

one hand producing and throwing away several million kilowatts of energy; with the other hand draining the nation's power grid of several million kilowatts of energy.

Even at that, the thing was touch and go. If the designers had had available last year, the work the Air Force's jet engine people have done on the high temperature metals, titanium and zirconium, they could probably have reduced the predicted time lag nearer six months—which might have swung the decision the other way.

The next round of production reactors, there's little doubt, will run hot enough to produce electricity. And that changes the whole economics of atomic power.

ATOMIC ECONOMICS

It works like this:

Suppose you are going to build a low-temperature reactor to produce plutonium for bombs. And suppose, to take some arbitrary figures, that for \$59 million you can build a unit that will produce half a pound of plutonium a day. Your cooling system will have to dispose of kilowatts of energy ranging into hundreds of thousands.

If you redesign your reactor to produce steam for a generating plant, it might turn out to cost, say, \$10 million more. Now \$60 million for a boiler (with chemical plant and generating equipment still to buy) is pretty steep. But since you were going to build a plutonium plant anyway, you could reasonably decide to charge to power only the extra \$10 million; plutonium would carry \$50 million of the reactor cost—plus fuel costs plus operating costs.

Result: steam at a capital investment of something like \$40 a kilowatt and no fuel cost—and that's dirt cheap.

RUSSIAN COMPETITION

Russian progress on atom bombs remains the big mystery. Despite the best efforts of U.S. and British intelligence, security behind the iron curtain is pretty impregnable. The best information still seems to be obtained by monitoring radioactivity in the atmosphere—plus reports from satellite countries, data on uranium mining in East Germany, and Russian orders for technical equipment placed in such countries as Sweden, Switzerland and Czechoslovakia.

The information adds up about like this:

1. The Russians made and detonated their first bomb in the summer of 1949.

2. They have exploded no bomb since. This indicates that they are still manufacturing their original model. This is almost certainly as good as our Hiroshima model, since they had access, through Fuchs and others, to the work on this model. It is possible, of course, that they made improvements of their own paralleling those we adopted in 1948.

3. The Russians are operating one plutonium plant somewhat smaller than Hanford. It is not known whether they have solved the operating difficulties which nearly stopped Hanford in 1946-47.

4. They are building, and may possibly have finished, a gaseous diffusion plant of the Oak Ridge type.

5. The above facts would indicate that the Russian output of bombs is about 10 to 20 a year, their stockpile: 20 to 40 bombs.

In expanding production, Moscow will run into one serious problem which is no obstacle to the U. S.: an adequate uranium supply. The Russians are working their Bohemian uranium mines with an urgency (ores are transported by air) which suggests that this field is their chief reliance.

If this is the case, it's good news. For not only are the Bohemian mines strategically vulnerable; they produce ores of a quality the AEC wouldn't be bothered with. The U.S. regards its Colorado-plateau deposits as decidedly marginal in quality; but back before the first world war Colorado was able to price the Bohemian mine out of the world radium market—until both were shut down by discovery of the fantastically rich Belgian Congo ores, chief source of U. S. supply.

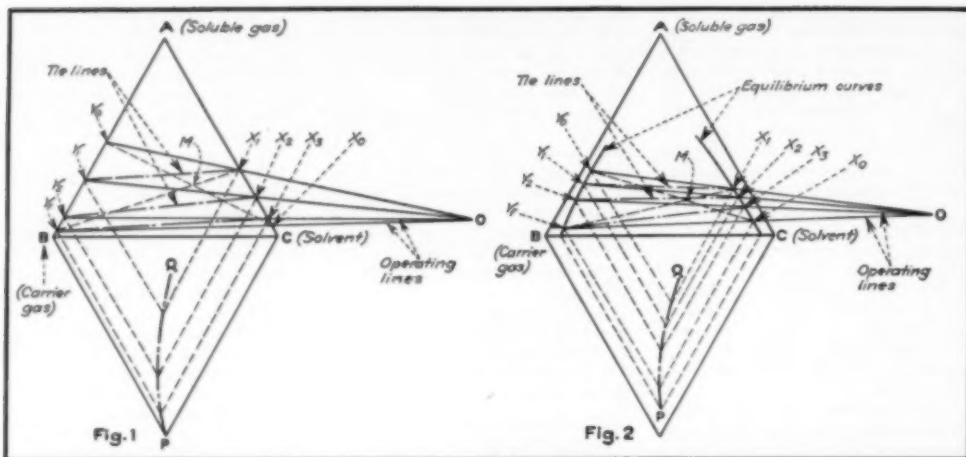
RADIOISOTOPES

Radioisotopes are very definitely on the market today.

In the long run these radioisotopes may constitute atomic energy's greatest contribution, not only in the fields of medicine, biology, agriculture and pure research, but in industry as well.

Some newer uses found: sterilization of foods and drugs; tracing of pipeline flows, radiography, production of certain chemicals, static eliminators, fluorescent lights and new types of luminescent paints.

To date, more than 18,000 shipments of radioisotopes have been made to more than 1,000 laboratories in over 500 institutions in the U. S. Radioisotopes are shipped to 46 states, District of Columbia and two U. S. territories. They are also shipped to institutions in 30 foreign countries. Total foreign shipments add up to 1,000; shipments to other AEC installations, 3,000.



New Way to Solve Absorption Problems

This method, based on the triangular diagram, allows for solubility of the carrier gas and vapor pressure of the solvent.

It is similar to that used in extraction calculations.

CHEN-JUNG HUANG

The commonly accepted analytical and graphical methods of calculation for gas absorption apparently involve the assumptions that both the solubility of the carrier gas in the solvent and the vapor pressure of the solvent are negligible. In practice, however, the carrier gas itself may be dissolved in the solvent to some extent and the vapor pressure of the solvent may be appreciable.

This paper will develop and illustrate a new graphical method of calculation for absorption operations which involves neither of these assumptions. This method is based on use of triangular diagrams. Although this discussion will consider only the calculation of countercurrent multiple-stage absorption problems, we can easily extend the new method to the calculation of packed and spray towers by employing the concept of the H.E.T.S. (height equivalent to a theoretical stage).

CHEN-JUNG HUANG, a graduate of National Taiwan University, is a demonstrator in the department of chemical engineering at the University of Toronto. He has made a special study of the applications of triangular charts to chemical engineering calculations.

Three-component phase diagrams are familiar to many chemical engineers; their fundamental characteristics have been reviewed in the references cited. One of their useful properties is called the "straight-line mixing law." In general, the over-all composition of mixture M, obtained by mixing some Y_i with some X_i , for example, must lie on the line Y_iX_i (see Fig. 1). And furthermore, the ratio of distances MY_i to MX_i equals the ratio of the weights of the mixtures X_i and Y_i which have been combined to form M. This is sometimes referred to as the "lever rule."

A solution of a gas in a liquid exerts, at a definite temperature and concentration, a definite partial pressure. If we know the equilibrium relation between the liquid and gas phases for the system under consideration, we can plot the equilibrium line on a triangular chart. When the carrier gas does not dissolve at all in the solvent and the vapor pressure of the solvent is negligible, the equilibrium compositions for the gas phase and for the liquid phase will coincide with sides AB and AC of a triangle whose vertices A, B, and C represent the pure soluble gas, carrier gas, and solvent, respectively (see Fig. 1).

When the carrier gas is dissolved to some extent in the solvent and the partial pressure of the solvent is not negligible, the equilibrium curves for each phase will be displaced inwards, such as curves $Y_1Y_2Y_3$ and $X_1X_2X_3$ in Fig. 2.

By plotting a few pairs of tie lines we can obtain a conjugate line PQ, using the method given in the International Critical Tables⁶ or Sherwood's method.⁷ We can then locate the composition of the liquid phase in equilibrium with any gas phase composition, or vice versa.

Now let us discuss a problem in which G_s lb.-moles per hr. of gas of a specified composition y_0 is to be contacted in a countercurrent multistage process with L_s lb.-moles per hr. of solvent (refer to Fig. 3). The solvent has an initial composition x_0 containing a small amount of the soluble gas. The lean gas withdrawn from the final stage has a given outlet composition y_r .

The calculation will first be based on the same assumptions made or implied by previous authors when dealing with a system consisting of a single soluble gas, a solvent, and a carrier gas: (1) The carrier gas, whether it is a single gas or a gas mixture, is as-

sumed to be soluble to a negligible extent in the solvent; (2) the soluble gas is dissolved solely by physical means in the liquid solvent, with no chemical reaction; (3) vapor pressure of the solvent is negligible; and (4) temperature and total pressure are constant.

Let us write a series of material balances for the quantity of soluble gas entering and leaving the various stages. For Stage 1,

$$G_0y_0 + L_0x_0 = G_1y_1 + L_1x_1 \quad (1)$$

For Stages 1 and 2 together,

$$G_0y_0 + L_0x_0 = G_2y_2 + L_2x_2 \quad (2)$$

For all three stages,

$$G_0y_0 + L_0x_0 = G_3y_3 + L_3x_3 \quad (3)$$

Eqs. (1) to (3) can each be rearranged as follows:

$$G_0y_0 - L_0x_0 = G_1y_1 - L_1x_1 \quad (4)$$

$$G_0y_0 - L_0x_0 = G_2y_2 - L_2x_2 \quad (5)$$

$$G_0y_0 - L_0x_0 = G_3y_3 - L_3x_3 \quad (6)$$

Expressing Eqs. (4) to (6) in generalized form,

$$G_0y_0 - L_0x_0 = G_ny_n - L_nx_n + x_{n+1} \quad (7)$$

Each side of Eqs. (4) to (6) may be considered as representing a hypothetical mixture whose composition and quantity would be exactly produced by addition of the negative liquid stream leaving any stage to the positive gas stream entering that stage. As previous authors^{1,2,4,5,7,8} have shown, a hypothetical negative composition may be represented by a point on a triangular diagram. Such a point, in general, lies outside the triangle, but has the same characteristics as a point within the triangle. Point O in Figs. 1 and 2 is an example of negative composition.

From these considerations, we can deduce this principle—that the lines joining the points representing the compositions of the gas and solvent streams entering and leaving any stage of the system must all pass through a common point O representing the negative composition of a hypothetical mixture. These lines, which may be called "operating lines," supply the relation between the gas stream entering a stage and the solvent stream leaving the stage. In conjunction with the tie lines, the operating lines permit the stepwise calculation of compositions of the streams from stage to stage in the process.

Composition of the Exit Solvent—Since compositions x_n , y_n , and y , are given, they can be located on the triangular chart (Fig. 1). Point M is located on line X_0Y_0 so that the ratio of lengths $MY_0/MX_0 = L_0/G_0$. By extending a line from Y_1 through M to the equilibrium curve for the liquid phase (side AC) we locate X_1 ; it repre-

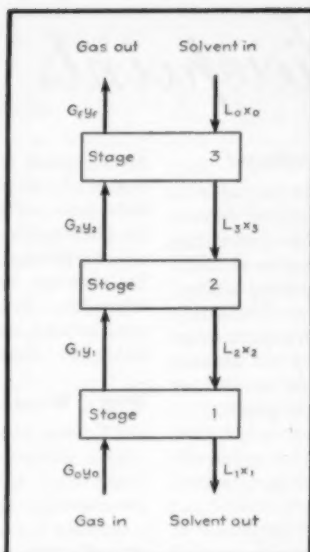


Fig. 3—Multistage absorber assumed in derivation of Eqs. 1 to 7.

sents the composition of the solvent stream leaving the system. If the four terminal compositions are given instead, the ratio of L_0 to G_0 is found by the "lever rule."

Number of Theoretical Stages—Having located points X_0 , Y_0 , Y_1 , and X_1 , we can locate the operating point O as the intersection of Y_1X_0 and Y_0X_1 . Starting from X_0 , we draw tie line X_0Y_1 . Point Y_1 represents the composition of gas phase leaving the first stage. The intersection of OY_1 with the equilibrium curve (side AC in Fig. 1) fixes the composition of liquid leaving the second stage.

Continue this procedure until the operating line coincides with or passes below the point Y_1 . The number of graphical steps used to reach the point Y_1 is equivalent to the number of theoretical stages required. Using a similar procedure, the graphical process may be carried out equally as well commencing at the opposite end of the system.

Minimum Liquid-Gas Ratio —When the operating line through O coincides with a tie line, no further absorption is possible—the system is in equilibrium. Therefore, the minimum liquid-gas ratio can be calculated by the "lever rule."

As has been indicated, the carrier gas is sometimes also soluble in the solvent to an appreciable extent and the vapor pressure of the solvent may sometimes be appreciable. This graphical method lends itself very well

to problems of this kind, provided the necessary equilibrium data are available. These data are plotted on a triangular diagram (see Fig. 2) to obtain curves representing the compositions of the gas phase which are in equilibrium with the concentrations of the liquid phase. These two equilibrium curves correspond to sides AB and AC in Fig. 1.

Composition of the exit solvent stream, number of theoretical stages, and minimum liquid-gas ratio for this case are calculated by the same methods as used in Fig. 1. The example of Fig. 1, assuming negligible mutual diffusion between carrier gas and solvent, is, obviously, a special case of the more general method shown in Fig. 2.

ACKNOWLEDGMENT

The writer wishes to express his thanks to Prof. G. W. Minard, University of Toronto, for his presentation of the problem and helpful suggestions, and to Prof. J. C. Elgin, Princeton University, for his valuable suggestions.

NOMENCLATURE

- G_0 = Quantity of gas entering first stage.
- L_0 = Quantity of solvent entering last stage.
- y_0 = Soluble gas content of gas stream G_0 .
- x_0 = Soluble gas content of solvent stream L_0 .
- G_1 = Quantity of gas leaving last stage.
- y_1 = Soluble gas content of gas stream G_1 .
- G_2, G_3, G_n = Quantity of gas leaving a particular stage.
- L_1, L_2, L_n = Quantity of solvent leaving a particular stage.
- y_1, y_2, y_n = Soluble gas content of gas streams G_1, G_2, G_n .
- x_1, x_2, x_n = Soluble gas content of solvent streams L_1, L_2, L_n .
- Y_1, Y_2, Y_n = Over-all composition of gas streams G_1, G_2, G_n .
- X_1, X_2, X_n = Over-all composition of solvent streams L_1, L_2, L_n .

(Quantities and compositions may be expressed in any consistent units, such as lb.-moles and mole fractions or lb. and weight percent.)

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Editorial Viewpoints

How Refute These Faulty Findings?

As author of a lurid article in the July issue of *American Magazine*, Representative Delaney draws a number of startling conclusions from the proceedings of his congressional committee's investigation of chemicals in foods. Many of the conclusions and most of the implications are wholly unwarranted. This article and several others currently appearing in popular magazines have obviously been inspired by the Delaney Committee proceedings, but they go far beyond any reasonable limit in their deception of the public.

We must now face two important facts. First, we must realize that Chairman Delaney apparently intends to use the committee proceedings as a basis for innuendo and demagogic attack on both food and chemical manufacturers. Second, it is important to note that little has been said by either food or chemical manufacturers for the committee records to demonstrate the many precautions regularly taken to make sure that chemical additives and chemical spray residues do not create an actual hazard to the public.

We are not too alarmed by the Delaney proceedings. They have long been the whipping post for legislators seeking to get their names before the public. So long as Congressman Delaney thus poses as a public savior, we shall be annoyed but not alarmed.

We are much more concerned with the fact that a review of the committee records does not show enough factual evidence presented by industry to demonstrate its very real concern for the public welfare. There is no adequate showing of the many and costly precautions that are regularly taken. There is no evidence that the occasional mistakes of the few unscrupulous, inexperienced or greedy men in industry are the very great exception. Reading the Delaney record one might think that the horrible examples cited by zealots were everyday occurrences. So it is important that industry demonstrate otherwise.

In all this deluge of new public attack on industry we find one bit of comfort. The worst critics are still rehearsing individual cases of years ago. They are still basing their arguments on highly improbable postulates, that something "might" be so. They continue to use over and over again mere fragments of technical fact or testimony, with implications that would be clearly incorrect if these fragments were not detached from their settings and put forth as though real or common evidence of public danger.

The Delaney Committee plans to continue its hearings during the fall and early winter. In light of these recent attacks, it now seems necessary that com-

petent factual testimony be entered into the record to give all parts of the picture accurately. If furnished these facts, we believe that a substantial majority of the Delaney Committee itself will repudiate the insidious and libelous statements and implications to which the chairman has attached his name in the article referred to. We believe that the committee and Congress will act constructively if they are given factual assistance. They should have it.

War, Wool and Warmth

Leading chemical manufacturers have pledged a quarter billion dollars as a demonstration of their confidence in the future of those synthetic fibers that are essentially alternates for wool. This new capital investment is a persuasive argument that the problems of wool scarcity are going to be alleviated to some extent by chemical enterprise. But it is still too early to predict that synthetics will soon do to sheep what nylon did to the silkworm.

Nevertheless, Stabilization Director Eric Johnston was recently quoted by the *New York Times* in an optimistic statement about the Defense Department's adoption of a synthetic warmth fiber as a means of bringing down the price of natural wool. This unnamed wool substitute, he said, "appears to be just as good as regular wool under supervised tests." It will be used in 20 to 30 percent mixtures with natural wool for uniforms and other military uses.

Joe Gordon, manager of the men's wear division of Burlington Mills, went the full way in predicting to a *New York Herald-Tribune* reporter that "the time is coming in five to eight years when wool will be a strictly luxury fiber. You will have to go to a tailor to have a wool suit made." Asked at what price wool would have to be offered to compete with synthetics, Mr. Golden said, "at no price."

Such conclusions, in our opinion, are wholly unwarranted. The facts are that wool supplies are short of the needs of the world. So we can expect the synthetic warmth fibers to fill the gap, even dig deeply into certain special markets. But those in the industry with the greatest enthusiasm and fullest understanding of the new fibers think of them primarily as supplements and not as replacements of wool.

Because chemical engineers have a heavy stake in the whole fiber program, we have made it the subject of a special editorial report in this issue of *Chemical Engineering*. Fibers are certain to have a tremendous impact on the chemical industry. And we are only at the beginning. In the years ahead we can expect

more research, more development, and wider acceptance of synthetic fibers in practically all types of textiles.

Futile Screaming for Tungsten

A special sub-committee of the Senate, headed by Senator Lyndon B. Johnson of Texas, has completed a preliminary report on its "Investigation of the Preparedness Program." Disregarding the inevitable demagoguery in such a political document, there are a few wise words about strategic materials that deserve our serious attention.

First, it is evident that many members of the Congress no longer have any confidence in the present system of planning and operating the stockpiling program. Second, the committee urges that "the necessary operating funds be transferred to a single government agency, such as the Reconstruction Finance Corporation," which could be held responsible for the whole program. This is obviously a return to reason by recognizing that a business project of this magnitude and complexity should be handled by a business agency of the government rather than by the military planners.

The committee's futile screaming for tungsten needed by defense industries and apparently overlooked by the stockpilers will have served a useful purpose if it directs serious attention of the legislators to the need for better planning and administration of this vital phase of national defense.

Burying the Hatchet

National Fertilizer Association and Tennessee Valley Authority have signed a memorandum of understanding to provide for an exchange of technical information and informal cooperation in research and development on fertilizers. This would seem to portend peace—at long last.

In the past we have sometimes criticized efforts of TVA to sell or give away fertilizers in a fashion that was obviously competitive with private enterprise. But even so, we are convinced that TVA has done vastly more good than harm to the fertilizer business. Now there seems to be a sound basis for eliminating even appearances of the annoying competition of government with industry.

The two agencies are going to appoint cooperating committees for exchange of information and for discussion of broad policies of mutual interest. Both will benefit. We trust that the newly named NFA representative who will devote full time to these problems, Dr. E. C. Kapusta, will be able to implement the very fundamental agreements which have been reached. We are sure that as better understanding of mutual interests develops between the leaders and the staffs of the two agencies, there will be constantly growing opportunity with both agencies for greater public service.

Shades of Pecos Bill

Those fabulous Texans are at it again. And they're outdoing even the feats of the legendary Bill. Investment in chemical plants and equipment on the Gulf Coast is close to \$1 billion now and slated to go higher, with 16 companies planning to spend \$100 million this year and next for further expansion. And still other expansion by chemical enterprises on the Gulf Coast awaits only the nod from NPA.

Despite the beanstalk growth of Gulf Coast chemical industry in the last decade, Texas is still principally a producer of chemical raw materials for processing elsewhere. Only the initial steps have been taken in Texas toward converting chemicals into finished products. For example, while Texas has much of the synthetic rubber industry, it makes few tires. Likewise in plastics and chemical intermediates, Texas has the basic materials in quantity and quality; but these are shipped out of the state to be further processed, only to be shipped back to Texas later as finished goods.

Only a few of the chemicals produced in volume are converted into end products in Texas for use by Texans. These are principally such products as insecticides, detergents and fertilizers.

A move into finished chemical products for consumers might be a wise next step for Texas, thinks Frederick A. Buechel, for 17 years assistant director and statistician in the Bureau of Business Research at the University of Texas. He's just completed a survey of the Gulf Coast's expanding chemical industry.

Dr. Buechel may have something there. Of course, distribution networks and growing population are essential to attract the production of consumer goods. But let's not overlook the fact that Houston, for example, has climbed in the last decade from twenty-first to fourteenth among American cities in population. Its metropolitan area now has over 810,000. And if it's consumers with money in their pockets that it takes to buy tires and plastic products, bear in mind that the total monthly payroll of the chemical industry alone in the Gulf Coast is almost \$9 million, or an average of nearly \$350 each for nearly 26,000 workers.

True, the production of end products from chemicals is still small in Texas. But don't forget that compared with the Northeast, the Midwest, or even the Southeast, industry came late to Texas. And the remarkable thing is that the chemical industry in Texas has done so much in such a short time.

Defeatists bleat that not much more industrial progress is possible in Texas; a decade ago these same defeatists called the industrial development of Texas a pipe dream. And look what happened.

But we agree with Dr. Buechel that further industrial development of the Gulf Coast and of Texas won't just happen. It will take the kind of hard work and intelligent leadership that can be provided by chemical executives and engineers.

Heat-Transfer Coefficients

The professor will say, "These methods are not rigorous enough."
The plant man will say, "These methods are much too complicated."
But the process engineer will say, "They are just what I need!"

G. F. DAVIES

Procedures given in this article will simplify the estimation of heat-transfer coefficients when all you need is an order-of-magnitude figure. These procedures will help you prepare preliminary estimates from the least possible process data and in the least possible time. Simplification will introduce certain inaccuracies, however, which you should avoid in the final design. To use these approximate methods properly, therefore, you must have an adequate knowledge of the principles of heat transfer.

DIMENSIONS OF UNITS

Units for heat-transfer coefficients in this article may be expressed in any consistent dimensions, such as Btu./hr. (sq. ft.) (deg. F.) or Pcu./hr. (sq. ft.) (deg. C.).

Over-all coefficients can be figured approximately from the formula:

$$U = \frac{1}{1/h_1 + 1/h_2 + 1/k + 1/P}$$

where h_1 and h_2 are the film coefficients on either side of the pipe wall and k is the coefficient of the pipe wall itself. Values for k may be estimated with the aid of Fig. 1.

Dirt coefficients are included in F . These coefficients have been found to vary widely for different cases. For order-of-magnitude estimates it is suggested that the following be used:

Oils and cooling water:	250
Treated water:	500 to 1,000
Organic liquids and gases:	500

DOUBLE-PIPE EXCHANGERS

Double-pipe exchangers are suitable for small installations, such as in pilot plants or small production units. When a large quantity of heat is to be

transferred, the cost of a double-pipe exchanger becomes excessive, compared to the cost of other types.

Maximum flows are usually dictated by pressure drop and power consumption; minimum flows by the desirability of having turbulent flow of the fluids. For liquids, linear velocities in the range of 3 to 6 fps. would be reasonable. A more important factor is the mass velocity, usually expressed as lb./sq. ft. (sq. ft. of pipe cross-section). Thus for heavy liquids a lower velocity may be satisfactory. For gases at pressures close to atmospheric, optimum velocities will fall in the range of 20 to 100 fps.

It is convenient in considering pipe exchangers to select a 1-in. pipe or tube as the datum. Film coefficients for typical liquids for a flow of 3 fps. in a 1-in. pipe will be somewhat as follows:

Water:	600
Saturated brine:	500
98% Sulphuric acid:	110
Light oils:	150
Alcohols and light organic liquids:	200

The general effects of changes in velocity and pipe diameter may be determined from Figs. 2 and 3. The coefficient for the annulus is based on its equivalent diameter.

For gases at close to atmospheric pressures with a velocity of 20 fps. in a 1-in. pipe, the film coefficient may be expected to be from 5 to 8 for the molecular weight range 2 to 70. Hydrogen is a particular case, and velocities of the order of 100 fps. may have to be used before turbulent flow is assured. Figs. 2 and 3 may also be used to determine the effects of velocity and pipe diameter.

For gases the film coefficient at a given gas velocity is reduced about 10 percent for every 100 deg. F. above a datum of 100 deg. F. Below 100 deg. F. the coefficient is increased by a factor of 10 percent per 100 deg. F.

With liquids, however, the effect of temperature on the film coefficient

is in the opposite direction and is subject to considerable variation. This effect has been neglected in this discussion for the sake of simplicity. In high temperature work, this neglect will result in conservative estimates and is not too serious. It should be realized, however, that at low temperatures the temperature factor may become very important.

SHELL-AND-TUBE EXCHANGERS

For most liquid-liquid exchangers the ratio of tube length to shell diameter is in the neighborhood of 6 to 1, but considerable leeway may be given. Tube diameters are usually small, say $\frac{1}{4}$ to 1 in.

It is advisable to standardize on tube length, say 10 to 16 ft. Longer tubes might be used if removal is easy, but shorter tubes are less subject to distortion at high temperatures.

The steps in estimating the over-all coefficient for a shell-and-tube exchanger are as follows:

1. Determine an average coefficient for the fluid inside the tubes. It is suggested that $\frac{1}{4}$ -in. tubes be assumed for a start if you are in doubt as to the tube size. The film coefficients given in the section on double-pipe exchangers may be used here, corrected for diameter as per Fig. 3.

2. Determine an average coefficient for the fluid outside the tubes. It is assumed that the exchanger will be baffled to the extent that no serious maldistribution will occur and that the shell-side fluid has a reasonable velocity. Pressure drop will have to be considered and, in general, the shell-side velocities will be lower than the tube-side velocities. A film coefficient of 400 would be reasonable for aqueous solutions and 100 to 150 for organic liquids. For gases outside tubes, take the film coefficient to be 5 to 15, using higher figures for the less dense gases.

3. Calculate the over-all coefficient, allowing for metal and dirt resistances.

G. F. DAVIES is a process engineer with Dominion Tar & Chemical Co., Montreal, Canada.

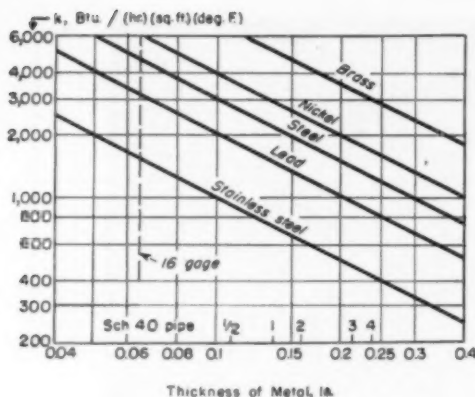


Fig. 1—Heat-transfer coefficients for metal walls. Note poor conductivity of stainless steel.

Some typical coefficients which have been observed for exchangers having tube bundles in the dimensional range given above are:

Water to water:	100 to 150
Gas to gas:	2 to 4
Gas to water:	20 to 40
Water to organic liquid:	50 to 100

CASCADE COOLERS

Cascade coolers consist of banks of horizontal pipes with water distributed over the top pipes flowing vertically as a film from pipe to pipe. They might be built from any size pipe, but 2- to 4-in. diameter pipes are most often used. They provide a relatively inexpensive method for cooling liquids or gases with water. If the liquid or gas being cooled is at a high temperature—very often the case—much of the cooling is accomplished by evaporation of some of the cooling water.

Heat-transfer coefficient inside the pipe may be estimated by the methods described for double-pipe exchangers. Outside coefficient is more difficult to predict, depending largely on proper distribution of water.

Water flow to the top pipe should normally be between 1 and 6 gpm. per ft. of pipe. Beyond 6 gpm. there is little to be gained. In fact, an excessive flow may cause splashing, resulting in maldistribution of the water. In evaporative cooling the water flow may be reduced considerably; a flow of about 0.2 gpm. per ft. is usually adequate.

An outside water film coefficient of about 600 might be expected with clean pipes. In the absence of evaporative cooling, this coefficient will be greater when the pipe diameter is smaller. However, exposure of the

wetted surface of the pipe to the atmosphere usually results in fairly severe scaling or slime formation. In addition to these fouling effects, maldistribution of the water will affect the heat-transfer efficiency.

Regardless of what you might get by calculation of individual film coefficients, you should use a value of 30 to 50 for the over-all coefficient in preliminary design of cascade coolers. This recommendation is based on indications that most cascade liquid coolers perform within this range, primarily because of the controlling resistance of the dirt film. For the cooling of gases when most of the cooling is by evaporation, an over-all coefficient of 4 to 10 is reasonable.

JACKETED VESSELS

In general, transfer of heat between the contents of a vessel and the liquid or vapors in the jacket is rather poor. Jacketed vessels find most use, therefore, where only moderate amounts of heat exchange are required.

A jacketed vessel usually has an optimum size wherein the heat-transfer surface bears a reasonable relationship to the cubical contents of the vessel. Direct scale-up in size of a jacketed vessel is often impractical, and since the optimum size is usually small, many jacketed vessels have immersed cooling and heating coils.

For steam-jacketed vessels the inside film coefficient will be controlling. With no agitation this film coefficient will be influenced to a considerable extent by the temperature drop across the film. With aqueous mixtures in the vessel, over-all coefficients of from 30 at 10 deg. F. temperature difference to 150 at 100 deg. temperature difference are reasonable. In most cases

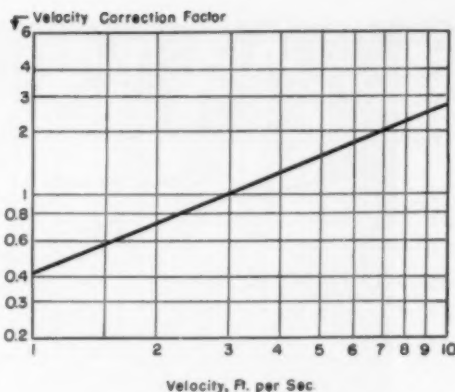


Fig. 2—Velocity correction factor. Apply to estimated film coefficient when velocity differs greatly from 3.0 fps.

the coefficient varies approximately as the 0.33 power of the temperature differential.

For water-to-water heat transfer in an unagitated jacketed vessel, an over-all coefficient of 30 is reasonable.

In agitated vessels the over-all heat-transfer coefficient will vary with the degree of agitation. Reasonable values are:

Steam to water:	150
Water to water:	60
Nitration or sulphonation mixtures to water:	20

The coefficients for organic liquids may be expected to be about half those for water in both agitated and unagitated jacketed vessels.

IMMERSED COILS

Immersed coils are relatively inexpensive and are particularly suited to use in batch process or reaction vessels. A coil of surface equal to the jacket surface in a jacketed vessel will increase the total heat transfer by about 125 percent. Tube sizes most frequently used for coils are in the range of $\frac{1}{2}$ to 2 in.

For a liquid flowing through a coil the approximate value of the inside film coefficient will be about 20 percent higher than the coefficient for flow in a straight pipe.

With natural convection in liquids the outside film coefficient will vary with the temperature drop across the film, as in the case of jacketed vessels. For natural convection a film coefficient of 30 to 50 will be conservative for most liquids when the temperature drop across the film is from 10 to 100 deg. F. With moderate agitation when the liquid is flowing across the coil with a linear velocity of about 2 fps., the film coefficient

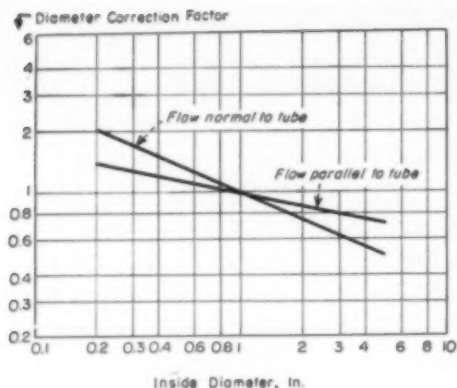


Fig. 3—Diameter correction factor. Apply to estimated film coefficient when diameter differs greatly from 1.0 in.

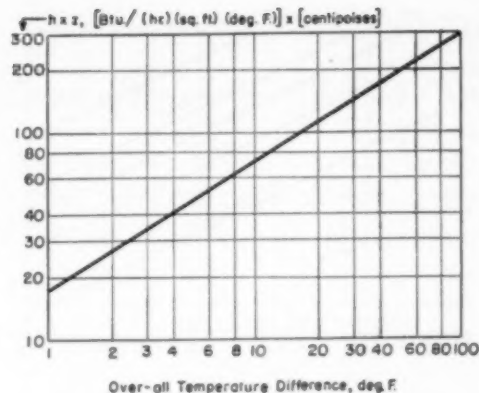


Fig. 4—Over-all heat-transfer coefficient, steam to boiling aqueous solutions. Note viscosity factor in vertical scale.

will be about 600 for water and about 200 for most organic liquids.

Pipe coils are often used for steam heating of a liquid. In this case most of the resistance to heat transfer is in the outside liquid and dirt films.

HEAT TRANSFER TO BOILING LIQUIDS

Design of equipment for boiling liquids introduces a factor which does not enter into other cases of heat transfer—one which may easily be overlooked. This factor is the critical temperature drop across the boiling film, or the temperature difference at which the maximum quantity of heat is transferred. For most liquids the critical temperature drop is in the range of 70 to 100 deg. F. Consequently it may be unwise, in making an estimate for a boiler, to allow a temperature drop over 100 deg. F.

Individual boiling coefficients vary widely with the type of liquid. Fig. 4, based on a series of experiments by Badger and Shepard, (*Chem. Met. Eng.* 23, 282, 1920) may be used for estimating the over-all coefficient for boiling water or aqueous solutions with steam, omitting any allowance for fouling.

Coefficients for boiling organic liquids run considerably lower than those for boiling water. For clean horizontal pipes or plates an over-all coefficient of about 250 would be reasonable for liquids such as benzene or alcohol when the over-all temperature difference is 50 to 70 deg. F. Allowing for fouling, the coefficient would be 50 to 100. Avoid using temperature differentials of less than 50 deg. F.

Boiling coefficients for calandrias will run about 25 percent higher than those for flat plates and coils. Co-

efficients for forced circulation evaporators and boilers parallel those for liquids flowing through pipes at high velocities and may be estimated on the same basis.

Another factor which should not be overlooked is the effect of temperature on the boiling coefficient. This may be of importance in designing for vacuum operation. Coefficients given in the literature usually refer to liquids boiling at atmospheric pressure. For most liquids, the film coefficient for a fixed temperature difference will increase about 100 percent for each 10 deg. F. above the normal boiling point. A decrease will result in a similar effect, reducing the coefficient by 50 percent for a 10 deg. F. drop in boiling point. This relationship gives a straight line on a semi-log plot. (For details see Cryder and Finalborgo, *Trans. A.I.Ch.E.*, 33, 359, 1937.)

CONDENSERS

Most organic vapors condensing on horizontal tubes show film coefficients in the range 200 to 400; ammonia, 1,000; steam, 1,000 to 3,000. Condensation inside tubes appears to give coefficients of the same order of magnitude as condensation outside tubes, but the drawbacks of liquid hold-up will be a factor.

In many condensers the water-side film will be controlling. Attention should be directed to achieving a good water velocity and keeping the tubes free from dirt. Water-side coefficients may be estimated by the methods previously outlined.

The condensation of mixed vapors of immiscible liquids, as occurs in steam distillation, will show coefficients which vary almost linearly from

organic to steam coefficients, depending on the relative proportions of the two phases.

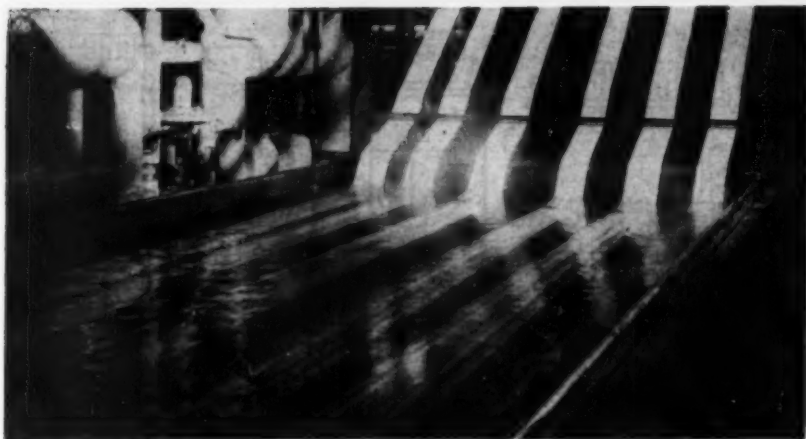
The presence of a noncondensable gas in the vapors passing through a condenser will have a profound effect on the over-all heat-transfer coefficients at every point in the condenser. The design of a condenser for this case is quite complicated; there seems to be no short method for approximating the surface requirements.

GAS HEATERS WITH TUBE BANKS

A common method for gas heating is to pass the gas across a number of rows of steam-heated pipes or tubes. Most of the resistance to heat transfer is in the gas film, and the over-all coefficient observed will not differ very much from the gas film coefficient. The number of rows of pipes will influence this coefficient to some extent due to increased turbulence. Any advantage due to the number of rows is said to level out at four rows.

For air and 1-in. tubes, a velocity of 10 fps. past the tube will give a coefficient of about 8, increasing to 20 at 60 fps. Four rows in the bank will have little effect at low velocity, but at 50 to 100 fps. the coefficient may be about 50 percent greater. Coefficients will be better for gases lighter than air and worse for gases denser than air. Fig. 3 may be used to estimate the effect of changing tube diameter.

Since higher gas temperatures mean poorer coefficients, it is suggested that for waste heat boilers the over-all coefficient be reduced about 40 percent. An over-all coefficient of 6 to 10 would be reasonable for flue gas velocities of 50 to 100 fps.



SYNTHETIC FIBERS

Rayon and nylon are being joined by several new fibers as the chemical industry moves deeper into the synthetic fiber business. A revolution is brewing.

CHEMICAL ENGINEERING REPORT—AUGUST 1951

SYNTHETIC fibers are becoming an important part of our domestic and business life. They are providing new and improved clothing, drapes, seat covers, screens, carpets, and tires. They also provide a host of jobs for chemical engineers.

A big
chemical
market

The textile industry now consumes about a quarter of all industrial chemicals sold. Every chemical engineer should look at the seeds of a revolution that have been planted in an old and conservative industry that until a few years ago thought that few special items might be made from these "imitation fibers" but they would never dig into the basic silk, cotton and wool markets.

First came the downfall of silk, helped in part by the shortage created by the war, completed by nylon's superiority.

Then came higher wool prices. Scoured wool jumped from \$1.63 per lb. in March 1950 to \$3.75 in March 1951. Result: new synthetic fibers are fast being woven into our economy.

Rayon staple has been getting more popular and nylon staple also made a big hit with the public as it appeared on the market on a commercial scale after World War II.

This report is designed to acquaint chemical engineers with the general production techniques, properties and uses of the newer fibers and to give a review of the viscose acetate and nylon fibers for use in comparing them with the newer fibers such as Orlon, dynel, Vicara, Dacron, Acrilan and saran.

All true synthetics are made by a series of basic steps. First step is preparation of a polymer consisting of extremely long chain-like molecules. In a liquid polymer these molecules are entangled with each other and make the melt very viscous. This viscous polymer is pumped through a multitude of small holes in a spinneret, solidified in a liquid or air.

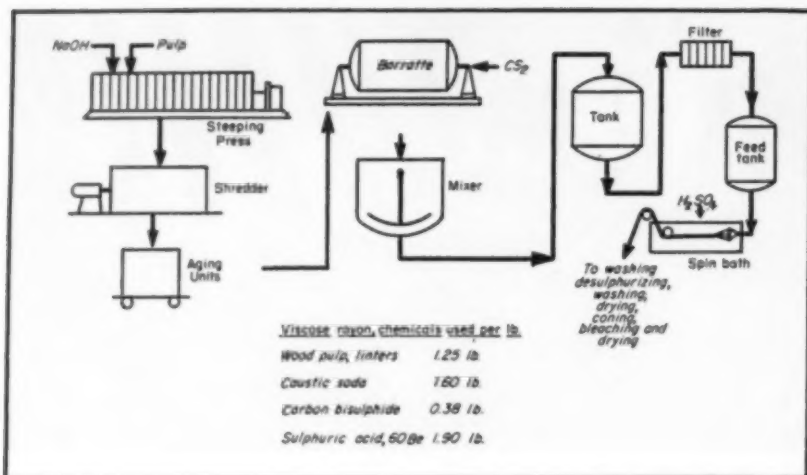
How they
are
made

At this stage the molecules are poorly oriented. Synthetic fibers in this condition are not strong or very useful, so they are stretched to orient the molecules and set up a crystalline lattice. A single polymer chain is long enough to occupy about four or five crystalline regions. By controlling the degree orientation and crystallinity a single polymer can be used to make a number of fibers with different mechanical properties. Some could be weak and stretchy, while others would be strong and stiff. But the range of any single polymer is always limited and several polymers are needed to cover the entire fiber field.

Stretching
helps
them

There are two elements that are important in determining the range of the polymer's mechanical properties. They are: (1) attractive forces between the molecules and (2) the flexibility of the molecular chains.

Understanding these fundamentals makes it easy to see why there is a market for more than one synthetic fiber. In many cases one supplements the other. Each of the many fibers now moving into the market will find its niche if it is properly priced for the job it is assigned.



Viscose Rayon

Biggest man-made fiber, it is produced in a host of plants for a wide variety of uses. It is our cheapest fiber.

Our cheapest fiber Viscose fibers find over half of their market in tires and other high tenacity uses. The yarn side of the fiber's market is pushing toward the 700 million pounds per year mark. It is the nation's largest man-made fiber and in addition to its tire market plenty finds its way into knit wear and broad woven goods. Small amounts are used in narrow woven goods and other uses.

Wood pulp is used It draws on cotton linters and wood pulp for its basic raw material. It is also a major consumer of sulphuric acid and caustic soda. Viscose is also the chief outlet for carbon bisulphide. In addition to its tremendous consumption of basic chemicals the industry uses very substantial quantities of dyes and other organic chemicals. Titanium dioxide is used in delusterizing the yarn to achieve more attractive appearance of the finished product.

Here is a breakdown of the percentage of some of the chemicals this fiber consumes:

	Percent
Caustic soda	20
Sulphuric acid	6
Carbon bisulphide	77

It is therefore a big factor in the health of chemical markets—it actually uses (along with viscose film) more than 10 percent of our industrial chemical output.

Plenty of plants The fiber is produced as yarn or staple in 15 states by 24 plants. Firms producing it include American Enka Corp., American Viscose Corp., Beaunit Mills, Celanese Corp. of America, Du Pont, Fair Haven Mfg. Co., Hartford Rayon Corp., Industrial Rayon Corp., Mohawk Carpet Mills, National Rayon Corp., North American Rayon Corp., Skenandoa Rayon Corp., and Woonsocket Rayon.

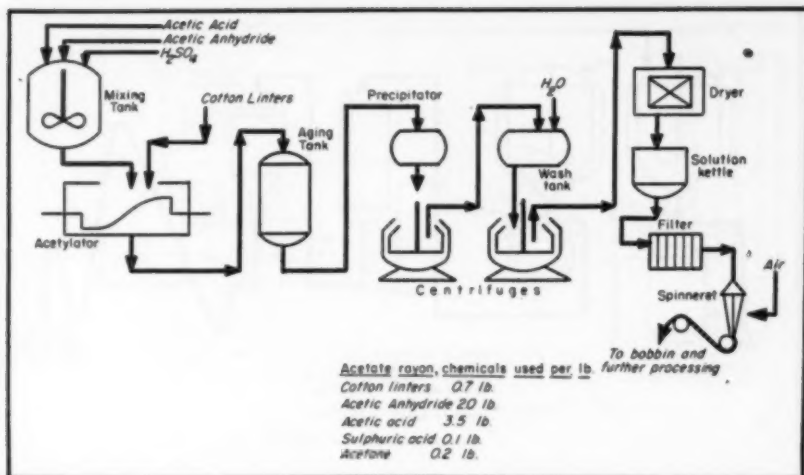
How it is made This is how it is made. Sodium hydroxide is added to wood pulp in a steeping press where alkali cellulose is formed. This is shredded and aged, then it is treated with carbon bisulphide in a barratte. Cellulose xanthate is formed. This is run into a mixer, treated with dilute caustic soda and the resulting viscose is run into ripening tanks. After ripening the viscose is filtered and passes through a feed tank to the spinning machine where the viscose filament form in a sulphuric acid and sodium sulphate spin bath. The yarn is then washed, reeled and desulphurized. Then it is washed or bleached, and dried.

Stretch for strength The difference in strength between ordinary textile yarn and high tenacity yarn is, of course, determined by the amount of orientation imparted to the fiber molecules in the course of manufacturing. The hydroxyl groups in the cellulose molecules in viscose rayon allows water absorption to take place in the fiber and serve to hold the molecules together through strong hydrogen bonding. Fibers of this type tend to maintain their strength better at high temperatures—thermoplastic fibers tend to soften and become weak.

Viscose can be dyed with the same classes of dyes as those used in cotton. Most common dyes are the direct and after-treated direct types. Vat dyes are also used.

Carpet manufacturers are using viscose and acetate to blend with wool to give a high quality carpet at lower cost. In the past few months this fact was emphasized by the purchase of three viscose rayon mills, one by Bigelow-Sanford Carpet Co., two by Mohawk Carpet Mills. Even this capacity will supply only part of the need.

Look at the price tag Viscose has an advantage in price over all other staple fibers—natural or synthetic. It sells for 40c. per lb. while cotton's average price is about 45c. per lb. This places it in a position to compete in places where the special characteristics of other synthetics are not important and where price is a large factor.



Cellulose Acetate

It is a versatile fiber, found in nearly every field of textiles used for personal wear or home furnishing.

Cellulose acetate fiber has a warm, soft handle. It is used in all kinds of women's wear. Men's ties, hose, summer suits and bathrobes are made with it alone or in blends with other fibers. It is also used in draperies and upholstery fabrics. Like most man-made fibers, it is resistant to mildew and bacteria.

Industrial uses include rope, tapes, webbing, electrical insulation and cords. However, the industrial uses of this fiber are very small compared with the use in apparel. Even during the last war the industrial uses only took about 18 percent of the fiber.

Here is how it is made: Acetic anhydride, glacial acetic acid and sulphuric acid (as a catalyst) are mixed in a glass lined acetylator. After this mixture is cooled, cellulose is added. The low temperature reaction runs for more than five hours, then the mass is diluted with acetic and sulphuric acids and aged. This aged cellulose acetate is diluted further with water and the flakes are washed and dried. The spinning solution is made by dissolving the flakes in acetone. The solution is pumped through a spinneret into a current of warm air. The dry filaments are gathered on a bobbin.

Filament yarn is made by twisting the threads before winding on the bobbin. Tow consists of threads gathered without twisting. It is later cut into short lengths for use as staple fiber.

There are seven plants in the United States which produce cellulose acetate fibers. American Viscose Corp. produces it at Meadville, Pa. Celanese Corp. of America makes it at Cumberland, Md., Narrows, Va., Rock Hill, S.C., and Rome, Ga. Celanese is the country's biggest producer of this fiber, turning out about 60 percent of the total made.

Du Pont makes it at Waynesboro, Va. Tennessee Eastman Division of Eastman Kodak produces it at Kingsport, Tenn.

Prices of cellulose acetate fiber have traditionally run above that of viscose. However, today cellulose acetate is one of our less expensive fibers. Acetate staple costs about 49 c. per lb. while the 150 denier filament yarn is only 76 c. per lb. (or 2 c. per lb. below viscose).

Dyeing acetate is done with acetate dyes. Since the fiber has few reactive groups compared with other fibers, it is less hygroscopic and more water repellant than viscose. This also makes it more difficult to dye. However, the acetate dyes do the job well.

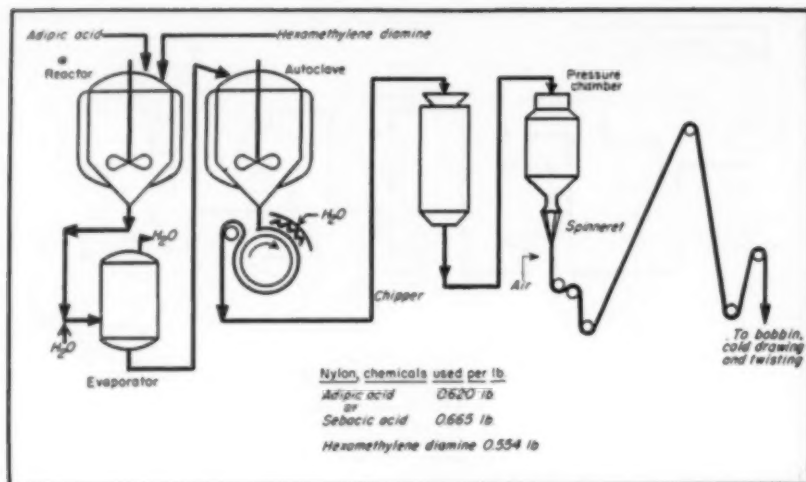
In volume, viscose and acetate textile filament yarns run neck and neck. This year the monthly output averages 26.5 million pounds per month. This is about the same as the 1950 rate and well ahead of any other year's operations. Use of acetate staple fiber and tow has been gaining ground steadily. This year the average monthly output is over 10 million pounds per month and it is running a million pounds a month ahead of last year's record rate.

In the future, acetate is going to feel the impact of some of the other synthetics. But with the growing use of blends, it may gain in new markets more than it loses in the old. Its price is far below any of the newer fibers and this advantage will help to keep it strong. It is a low-cost luxury fiber with interesting possibilities in the new combinations.

Acetate markets will continue to grow in the opinion of many textile experts in spite of the newer fibers. This reasoning is based on the premise that newer fibers will open new markets and acetate too will find new outlets. While the total fiber market is limited by the needs of the people, the needs continue to grow. Traditional ratios of fiber consumption per unit of population will be increased as the new fiber pattern meets both domestic and commercial requirements.

Takes acetate dyes

Textile yarn is big market



Nylon

Wide acceptance of this fiber makes it grow. Latest expansions will double productive capacity.

How it is made

Nylon is commonly produced by reacting hexamethylene diamine and adipic acid. This forms a nylon salt, which in turn becomes hexamethylene adipamide with the removal of a molecule of water. In turn this is polymerized and converted into a linear polyamide.

Commercial spinning operations for nylon differ in some respects from other man-made fibers. The solid polymer is melted and the molten polymer is pumped through a spinneret. The bundle of filaments is frozen as it passes down through a stream of air. The solid filaments are not very useful in this state and better properties are developed by stretching them to about four times their original length. The "necked down" fibers remain extended and the molecular structure is oriented—since all mechanical properties of fibers depend on the amount of orientation and crystallinity in the final product.

Out on a limb

Nylon's first claim to fame came in the development of its use in women's stockings. Then came the host of new wartime products. During the war the military uses of nylon grew so fast that nylon stockings were almost unobtainable. But when the war ended nylon resumed its dominant position here and branched into other clothing as well as furnishings and industrial uses. Blends of nylon staple found their way into socks, suits and other wool-type fabrics.

Du Pont is sole producer of nylon, but Chemstrand Corp. has been licensed to make it. The firm is building a new plant at Pensacola, Fla. This unit will be running in 1952 and will produce about 50 million pounds per year. Du Pont is making nylon at Belle, W. Va. There its 1951 capacity is estimated at 50

million pounds. Other nylon making facilities are located at Niagara Falls and Orange, Tex. This year the Victoria, Tex., plant started operating. In 1952 the Memphis adiponitrile unit will start using furfural and sodium cyanide to make the nylon intermediate which is used to make hexamethylene diamine.

Du Pont's nylon capacity in 1950 was about 100 million pounds. This year its capacity will be 170 million pounds and in 1952 the figure will probably reach 190 million pounds.

Like all fibers that become popular, nylon has certain properties that are superior to natural fibers. It is stronger than any natural fiber, including silk. Its wet strength is about 80-90 percent of the dry strength—a very valuable feature. Nylon also has good flexing qualities which makes it popular in stockings. It has an abrasion resistance that is four to five times better than wool. Nylon's stretch recovery is excellent. If stretched 8 percent it recovers its original length when tension is released. Nylon is very alkali resistant and will not support mildew or bacteria.

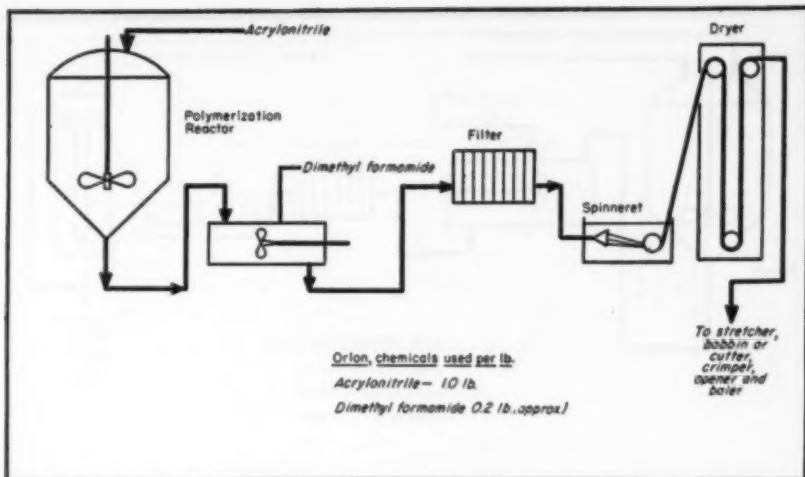
Good wet strength

Dyeing nylon is carried out with the use of all acid, acetate, pigment, chrome and some of the other colors. But it has a low affinity for direct cotton, sulphur and vat dyes. Acetate dyes give uniform colors, but their light fastness is not too good.

To prevent permanent creasing, dyeing temperatures should be held below 85 deg. C. Nylon's high tenacity has made it a big factor in parachute fabrics. It is also used in tire cord, seat coverings, dresses, sweaters, underwear and girdles as well as bathing suits, snow suits, jackets and rain coats.

Nylon costs \$1.70-1.80 per lb. in staple form and its unique qualities make it attractive for use with wool at \$2.50 per lb. However, both acetate and viscose are cheaper. Rayon staple is 40c. to 50c. per lb.

Biggest outlet for all synthetics will be in blends with other natural and synthetic fibers.



Polyacrylonitrile

First of the acrylics, it is made by Du Pont. Will be used by several firms with other materials.

Plenty of
Orlon
uses

Polyacrylonitrile is the major component of several new fibers now in the process of reaching commercial status. However, Du Pont's Orlon is the first polyacrylonitrile fiber to be in commercial-scale operation. Since it is new, it is still searching out its place in the textile market. It has been hailed as the big industrial fiber of the future. But it isn't neglecting the clothing market where it competes with wool. Typical uses include industrial application in fairly high temperatures or acid conditions. Its high resistance to degradation by sunlight and weather make it an excellent fiber for use in tents, awnings, sail cloth and rainwear. It is also finding use in apparel. Men's summer suits containing it are wrinkle resistant and cool. Women like it in dresses and in foundation garments.

Raw material for this fiber is acrylonitrile. Current supplier is American Cyanamid. Its Warners, N. J., plant produces about 27 million pounds per year. Output is shared with the needs of nitrile rubber. The acrylonitrile is made by the reaction of ethylene oxide and HCN. In the presence of a catalyst ethylene cyanohydrin is formed. This breaks down to acrylonitrile and water. Some new plants will make acrylonitrile from acetylene.

The fiber is produced by polymerizing the monomer and extruding it through a spinneret to form the fiber. Du Pont's first unit was a 6 million pound-per-year yarn plant. This was built at Camden, S. C. The second is going up at that site. It is a staple fiber plant. These plants will have an estimated capacity of 37 million pounds per year by 1952.

Dissolve
and spin

Spinning polyacrylonitrile requires formation of a solution of the polymer. It can be dissolved

in many concentrated solutions of salts like lithium bromide, sodium sulphocyanide, and others. But organic solvents like dimethyl formamide, dimethoxyacetamide, tetramethylene cyclic sulphone, meta and para nitrophenols give better results.

The discovery of the proper solvents for preparing the spinning solution of the polymer made it possible to launch commercial fiber operation. Today Orlon, like nylon, represents a whole family of fibers.

Du Pont's current production of the yarn and staple Orlon, is a "non-dyeable" type. Du Pont reports that Orlon is potentially dyeable in several classes of dyestuffs and that deep bright colors with good wash fastness and acceptable light fastness can be obtained. Dyeable Orlon types are generally copolymers.

Dyeing
is a
problem

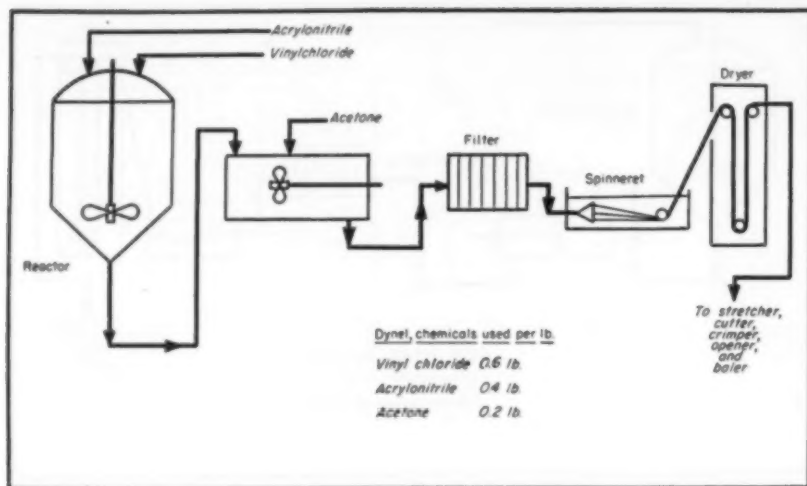
The continuous filament yarn is very similar to silk in appearance and feel. The staple fiber is similar to wool. It has excellent bulking power, high thermal insulation and wrinkle recovery. It will supplement nylon in many places, but nylon has better abrasion resistance, stands up better in air at slightly higher temperatures and has much better alkali resistance than polyacrylics.

Du Pont once estimated Orlon's market as big as nylon's and this means we should see production shoot up to the 200 million pound per year mark in the 1950's. Acrylics will of course dig into the markets held by other fibers principally into wool.

A big
market
here

Some textile experts feel that polyacrylonitrile itself has somewhat limited applications until the dyeing problem is solved. The acrylic fiber has much to commend it, however, and its properties should continue to allow it to play a part and shine in the expanding spectrum of true synthetic fabrics.

Blends with natural fibers give special characteristics that make it desirable for many applications.



Acrylic Copolymers

Blending of acrylonitrile with other resins gives good results. Several are comers.

Mixes
add
variety

Several acrylic and vinyl blends are (or soon will be) flowing to market. Carbide and Carbon Corp.'s dynel fiber is a copolymer of acrylonitrile and vinyl chloride. Carbide is currently expanding both its raw material units and its fiber producing plant. It will be making 8 million pounds in 1952. Uses for dynel include work clothing, water softener bags, dye nets, filter cloth, blankets, draperies, sweaters, pile fabrics, men's hose, and women's clothes. Carbide has offered dynel as a generic name to broaden the word. It is supplied in staple form and is dyeable in deep and pastel colors.

How
dynel
is made

Here is how dynel is produced. It is prepared in a reactor where a copolymer of vinyl chloride (60 percent) and acrylonitrile (40 percent) is formed. This copolymer is dissolved in acetone, filtered and run through a spinneret where the fibers are formed in the spinning bath. Next the fiber is dried, then it is stretched, cut and crimped. The spinning of the fiber is similar to the wet-spinning process used by other synthetic fibers. A water bath is used. The fiber is cut to the desired staple length, stabilized and opened. It is packaged and shipped in 300-lb. fiberboard bales.

Price
beats
wool

At its current price, (\$1.25 per lb.) dynel competes with wool (\$2.49 per lb.) and nylon staple. However, dynel was not developed to compete directly with wool. While it combines the texture and warmth of wool, it won't support combustion. It is washable, almost shrink-proof, and holds its shape well.

It can be dyed a good range of colors using several types of dyes. Selected acetate dyes, and some acid dyes can be used. Carbide developed a special copper dyeing technique. The fiber is originally a honey color, but it can be bleached white.

It can withstand temperatures up to 240 deg. F. before shrinking. Since it is a thermoplastic, it is possible to put in permanent creases and pleats as one of the finishing steps in fabric manufacture.

Dynel is by no means the only acrylic copolymer. Chemstrand Corp. is building a large plant at Decatur, Ala. The plant will have a capacity of about 30 million pounds per year. To date Chemstrand's Acrilan fiber composition has not been disclosed. The firm is carrying out evaluation tests on three copolymers. At least one is made up of three component raw materials. One of the experimental fibers is said to contain acrylonitrile and vinyl acetate.

American Cyanamid—a pioneer in acrylonitrile—has just started producing an acrylic copolymer at a pilot plant in Stamford, Conn. The new fiber is tentatively called X-51. The company is currently carrying out an evaluation program on the fiber. No definite composition has been announced, nor any plans for large-scale commercial production.

Du Pont is working on an acrylic copolymer which is dyeable and may be produced as an Orlon fiber.

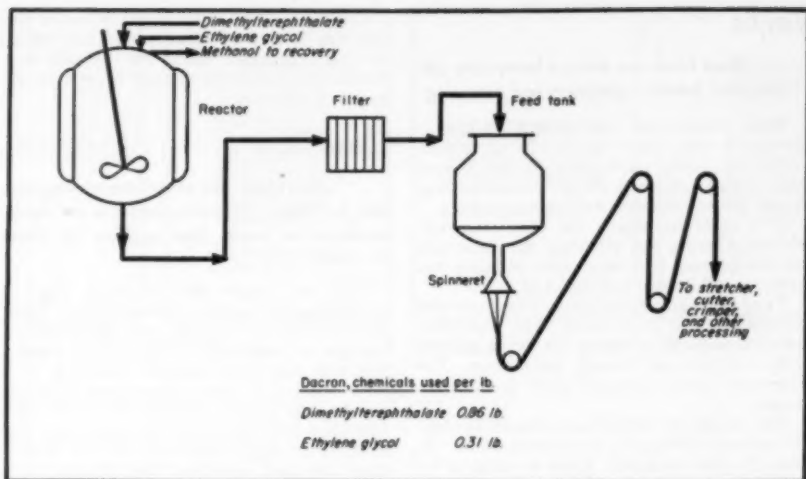
Further in the future is Eastman Kodak's Tennessee Eastman division's series of copolymers which contain polyacrylonitrile and minor quantities of 2-methylalcohol, n-allyl cyanide, or methallyl cyanide.

Industrial Rayon has patented some acrylic copolymers too. Here the other raw materials include itaconamide or small percentages of itaconic acid, fumaronitrile, methyl cyano-acrylate or cyano-acrylamide.

These fibers and others to come will be digging deeply into the 500 million pound per year wool market. Just how much each fiber will take from wool and cotton is hard to determine at this point. But with several firms moving into the business, natural fibers and some of the older synthetics will undoubtedly have their growth retarded.

Several
copolymers
coming

Wool
will be
helped
and hurt



Polyesters

Newest fiber to catch the public fancy, it will add new woes to wool sales. It is light and warm.

Another
DuPont
fiber

The polyester, Dacron, is a condensation product of dimethyl terephthalate and ethylene glycol. Du Pont has licensed the process from Calico Printers Association, Ltd., and will utilize the work done by Carothers. It will be produced commercially at a plant near Kinston, N. C., under construction. This plant was originally slated for nylon operations. However, plans have been revised and the plant will turn out 35 million pounds per year of Dacron initially and this capacity may be further expanded later. The \$24 million unit will be running next year. Annual output will include 10 million pounds of yarn and 25 million pounds of staple fiber.

Limited quantities now produced in this country are being turned out at Seaford, Del. Du Pont is expanding its raw material supplies for this fiber at Gibbstown, N. J. There, bigger output of nitric acid and dimethyl terephthalate is being pushed. The process uses p-xylene which is oxidized directly to the ester in the presence of nitric acid and methanol.

The dimethyl terephthalate will be shipped to Kinston where it will be reacted with ethylene glycol to produce the fiber.

Uses
glycol
plus ester

In producing the fiber the raw materials are added to the reactor. The polymerization is carried out at a high temperature using a vacuum. The glycol and ester reaction releases methanol and a polymer chain containing about 80 benzene rings is formed. The material, like nylon, is spun from the melt. The filaments are stretched about four times their original length. Fine fibers may be stretched hot, but the heavier filaments are stretched cold.

Cresses
stand up
better

The lively resilience of this fiber makes it particularly well suited for production of knit fabrics such as sweaters and socks. Men's suits

made from it can be washed and worn without pressing. The fabric can also be dry cleaned. The fiber is much stronger than wool, nylon, Orlon, or silk. Its crease recovery at 60 percent humidity is almost as good as wool, at 90 percent humidity its crease recovery is 20 percent better than wool and when wringing wet it is 40 percent better than wool and 8 percent better than Orlon. From the consumer's point of view this ability to resist wrinkling is one of the most important aspects of textile performance.

Like other commercial synthetics it can be used alone or as a blend with natural fibers to give a wider variety in fabrics. New synthetic furs have been developed using Dacron, acrylic fiber and viscose rayon.

Blends
yield
furs

Clothing is not the only place where the fiber excels. Its light weight and high stretch resistance make it useful in fire hose. Using this fiber, about 40 percent more hose could be carried on a fire truck without increasing the load. Other uses include power belting, filter cloth and sewing thread.

Dacron can be dyed with acid and acetate dyes. Good fastness to washing, perspiration and dry cleaning can be obtained. Light fastness varies considerably but is satisfactory for most uses. Dispersed dyes can be applied to raw stock and yarn by pressure dyeing techniques at 250 deg. F. using package machines. It can also be colored with selected dispersed dyes and vat pigments with the Thermosol process.

Dacron
can be
dyed

Experimental prices of the staple fiber are \$1.80 per lb. The filament prices (also experimental) range from \$2.15 to \$3 per lb. At these prices the material can compete with wool and can be used to supplement the properties of the present commercial synthetics.

In Great Britain, the polyester is being produced by Imperial Chemicals Industries on a small scale. The firm is building a plant to produce it under the trade name, Terylene. The new plant is being built at Wilton—will have a 11 million pound annual output.

Vinyls

These fibers are doing a heavy-duty job in industrial fabrics, upholstery and screening.

Mixed
vinyls

Vinyl chloride and vinyl acetate are copolymerized to form a fiber that is resistant to acids and alkalis, sunlight and aging. It can be dyed with dispersed dyes with the aid of some swelling agents, solvent methods and pigment dyeing.

It is made by mixing the copolymer with acetone, filtering, and extruding the fibers with the dry spinning technique. After standing, the fibers are wet twisted and stretched.

Saran
has a
spot too

Vinyl chloride and vinylidene chloride are also copolymerized to form a fiber. The copolymer, saran, is prepared by mixing the two monomers with a catalyst and heating the mixture. The fibers are formed and sold under several trade names.

The copolymer is heated and extruded through the orifice at 180 deg. C. It is cooled in air. The fibers are then stretched. Color is added in the melt before spinning by addition of pigment in the mass. Output of saran is now 20 million pounds per year. Dow is adding to its saran capacity at Freeport, Tex.

Its resistance to mildew, bacterial and insect attack make it suitable for insect screens. Its resistance to chemicals makes it suitable for filter cloth applications. It has been widely used for upholstery and other home uses.

Vinylon
from
Japan

Polyvinyl alcohol fiber under the trade name Vinylon has been developed in Japan for use in clothing manufacture. Various treatments can give it the appearance of silk, cotton, hemp or wool. It is strong, abrasion resistant, has good dyeing properties and has strong resistance to alkali or acids. Commercial operations started this year.

Zeins

Unlike most synthetics, dyeing is no difficulty here. It dyes better than wool.

Corn is
source

Zein fibers like Virginia-Carolina's Vicara are made from corn protein. The zein is removed from the corn meal by solution in alkali, followed by precipitation in an acid solution. It is washed and dried. The spinning solution is prepared by dissolving it in an alkali, extruding the solution into an acid bath where the fibers form. The fiber is then cured, stretched and run through several hardening baths. It is further treated to improve the resistance of the fiber to boiling water. Then the fiber is washed, the tow is dried and processed to staple fiber.

Acid and chrome colors can be used to dye Vicara, in fact care must be taken in blends of wool and Vicara or the Vicara may dye more deeply than the wool.

Vicara
blends
well

Vicara has a soft warm handle and blends well with wool. Blends with nylon give water absorption in the fabric. With rayon it adds suppleness.

Capacity of the sole producing plant in the country (Taftville, Conn.) is about 25 million pounds per year.

The fiber sells for about \$1 per lb. and at this price can be used to enhance wool and reduce the cost of the final fabric. For the fifth consecutive year world consumption of wool has exceeded production.

Much
cheaper
than
wool

Glass Fibers

Glass fibers and others are making new uses for fibers. Nature's products are being broadened in scope. New markets for fibers are opening up.

There are several other synthetic fibers in various stages of commercial development. Fiberglass, of course, is one of the most widely known. Fiberglass is used in many applications where a fiber with high heat resistance is needed. It is put to work as an insulating material in stoves, aircraft, and industrial as well as home uses. The glass fibers are also used in drapes and other fabrics. Biggest glass fibers are the "broom-straw" size used in furnace filters to clean circulating air. The fibers can be produced in a wide range of sizes and the prices range from \$9 per lb. for the most slender to 7c. per lb. for the cheapest.

Glass
uses

Biggest producer is Owens-Corning Fiberglas Corp. which started operations in 1938. However, the modern techniques of glass fiber production dates back to 1931. About that time Owens-Illinois Glass found that low-cost fibers suitable for air filters could be produced by blowing steam through molten glass and collecting the fibers on a moving belt. This product can also be used for insulation and plastic molding operations as a reinforcing agent. The filaments are also produced by drawing molten glass through holes in a spinneret. This is then wound on spools which can be operated up to 120 mph.

Glass
making

Owens-Corning Fiberglas units are located in Ashton, R. I., Huntington, Pa., Anderson, S. C., Santa Clara, Calif., Kansas City and Newark, N. J.

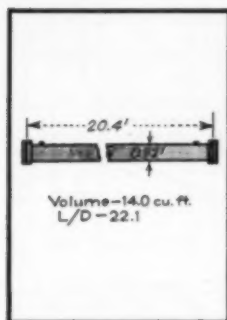
Libby-Owens-Ford Glass Co. is beginning to produce a glass fiber for use in insulation and plastic reinforcing as well as that used in automobiles. The producing site is a new fiber plant at Parkersburg, W. Va.

Glass Fibers, Inc. has producing units at Defiance and Waterville, Ohio. Perrault Brothers has a plant in Tulsa. American Air Filter is operating at Louisville, Ky. Tilo Roofing is making the fiber at its Glassfloss Division in Hicksville, N. Y. Guston-Bacon Mfg. Co. started producing the fiber this month at Kansas City.

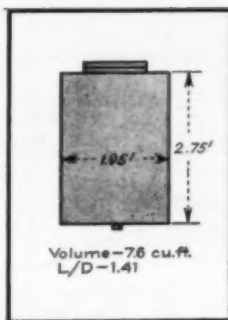
Dyeing can be achieved through the use of resin bonded pigments. A special technique utilizes protein film applied during manufacture for direct, acid, vat, and chrome colors.

This report can not cover all of the plastic and other materials which have found their way into the textile industry. It is not intended to be a complete encyclopedia on all fibers. It is designed to show how each of the fibers mentioned is making chemical engineering a part of the textile industry.

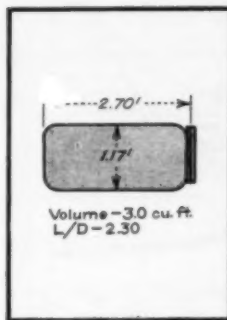
Epilogue



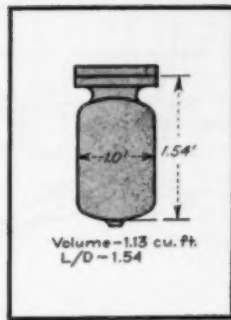
1 Pipe



2 Drum



3 Tank



4 Vessel

Test Explosions in These Provide
First Comprehensive Data To

Design Closed Vessels to Withstand Internal Explosions

Extensive tests with rupture disks provide
data on explosions in various sizes and strengths
of vessels, for various gases and vapors.

E. W. COUSINS and P. E. COTTON

Many pieces of industrial equipment—mixers, churns, reactors, autoclaves—may unavoidably contain mixtures of combustible gas or vapors. These gases may cause an internal explosion. To design a vessel thick enough to withstand such a blast would be impractical (a tank normally operating at 25 psig. would have to have its thickness increased by a factor of 10 to withstand the rapid stresses of an internal explosion).

The economical way to make these vessels safe is, of course, to reduce the pressure. In some cases, inert gas can be added to make the gas or vapor mixture non-flammable or to greatly reduce the flammability. The alternate method is through the use of bursting disks. The difficulty of this latter method is that very little data have been available with regard to the effect of disk strength and vent area on the maximum explosion pressure.

Except for some data on open vents for containers operating at atmospheric pressure, and a paper by Merl D. Creech entitled "Combustion Explosions in Pressure Vessels Protected With Rupture Disks" published in Vol. 63, No. 7 of the *ASME Transactions*, most of the data available are for closed vessels of 1 liter capacity.

Tests were conducted by Factory Mutual Laboratories with mixtures (at maximum explosiveness) of hydrogen and air; and of propane and air. Initial pressures were 0, 15, and 45 psig. Ratio of venting area to volume was

made variable in vessels of 1.1 to 20 cu. ft. capacity. Several strengths of disk were used.

Test vessels 1, 2, 3 (above) were used at 0 psig. initial pressure. Vessel 4 was especially constructed to withstand the high explosion pressures developed in tests at higher initial pressures.

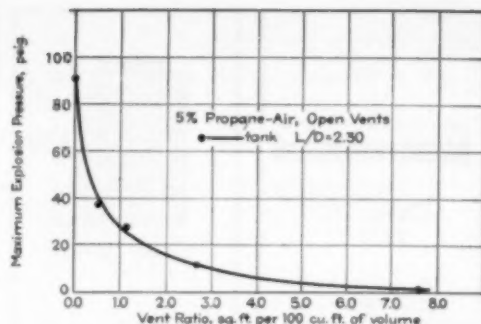
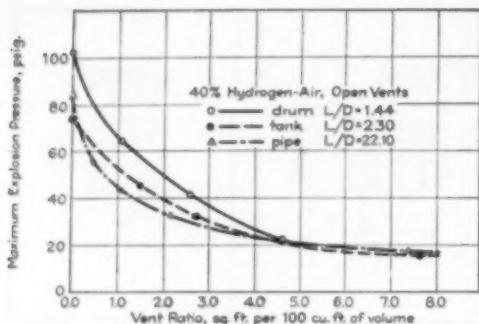
The hydrogen-air mixture was intended to represent a relatively rapid-rate burning material; the propane-air mixture a medium-rate burning material comparable to many solvent vapors. The particular concentration ratios of hydrogen to air and propane to air were chosen to give maximum pressure of explosion, maximum rate of burning and reliability of ignition. The gases were thoroughly mixed, lighted by an electric match.

Disks, used for tests at initial pressures above atmospheric were 2S-O aluminum of various thicknesses. Disks of hard Monel, spring-temper brass and soft copper were also used. All of the disk material (in the size and thickness to be used) was burst by subjecting each to a slow increase of air or nitrogen pressure.

Explosion pressures were measured with an electronic apparatus especially designed for the measurement and recording of explosion pressure. The pressure-sensitive element is a condenser, one side of which is a diaphragm exposed to the pressure to be measured. Increasing pressure decreases the spacing between the plates of the condenser thereby increasing the capacitance. The remainder of the apparatus is a bridge circuit for measuring the change in capacitance of the sensitive element. The change is displayed on a cathode ray tube where it is recorded as a photograph of the pressure time diagram shown by an oscilloscope. Timing marks are made at intervals of 1/60th of a second.

E. W. COUSINS and P. E. COTTON are research engineers with Factory Mutual Laboratories. This article is based on a paper presented by the authors before the Second Process Industries Conf., ASME, Baltimore, April 18, 1951.

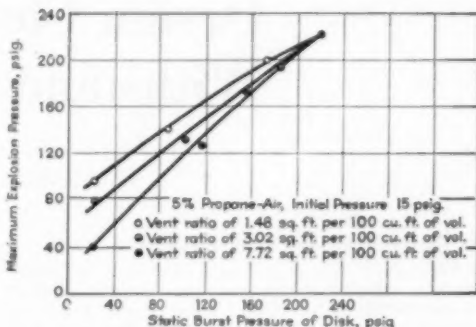
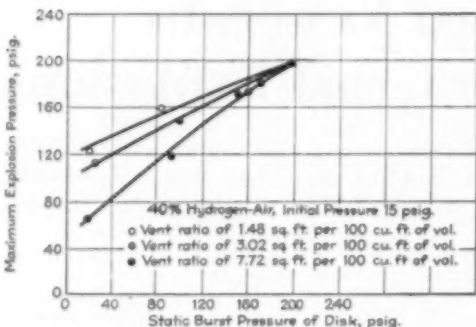
Test Explosions, Results . . .



HOW OPEN VENTS REDUCE EXPLOSION PRESSURES

Graphs show result of explosions initiated at atmospheric pressure. The effect of L/D (ratio of length to diameter of the vessel) is slight because the container volumes did not vary in the same order as L/D. Because the explosion pressure in the tank differed

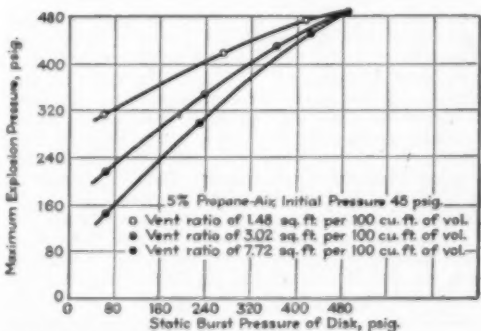
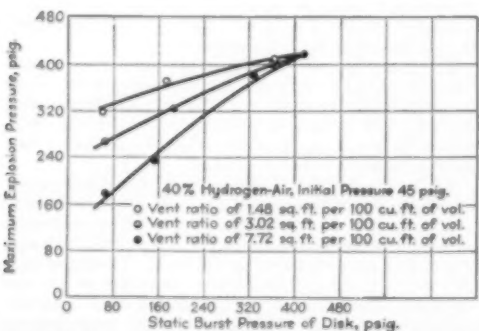
from that in the drum by only 12 psi. max., all later tests at 0 psig. initial pressure were run with the tank. As expected, slower burning propane-air is vented more easily than H₂-air. Each point average of 5 tests.



HOW HIGH EXPLOSION PRESSURES GO BEFORE RUPTURE DISKS BURST

Effect of rupture disk strength and vent ratio on max. explosion pressure at initial pressure of 15 psig. For H₂-air and propane-air max. explosion pressures are 198 psig. and 220 psig. re-

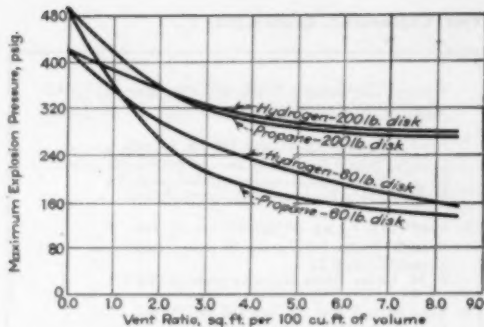
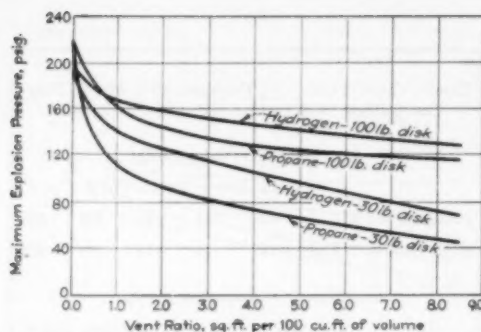
spectively. These are max. internal pressures to which a vessel of similar L/D would be exposed by explosion of gases of similar burning rates and same initial conditions.



HOW HIGH EXPLOSION PRESSURES GO WITH HIGHER INITIAL PRESSURES

Same conditions and significance as above except that data are for 45 psig. initial pressure. Again, max. internal pressures are 417 psig. and 489 psig. for H₂-air and propane-air respectively. As

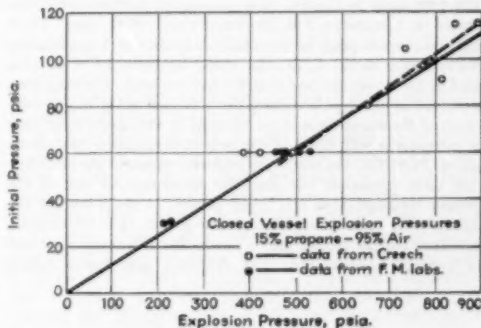
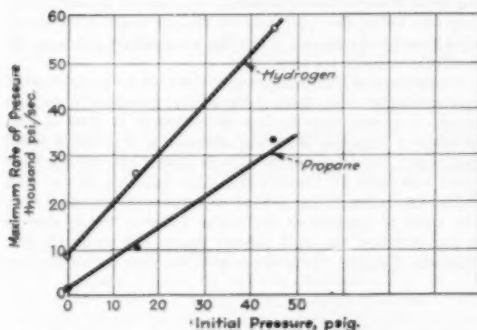
would be expected, the explosion pressure increases as disks of increasing strength are used. Explosion pressure also increases as the vent ratio is decreased.



HOW VENT RATIO REDUCES EXPLOSION PRESSURES WITH DISKS IN PLACE

The effect of vent ratio is illustrated by graphs derived from the direct plot of the data by finding the explosion pressure at the tested vent ratios for arbitrarily selected disk strengths. Explosion

pressure then plotted against vent ratio for each selected disk strength to give an explosion pressure-vent ratio which is easier to apply to problems of existing equipment or new designs.



HOW THE INITIAL PRESSURE AFFECTS MAXIMUM RATE OF PRESSURE RISE

Relation of max. rate-of-pressure rise to initial pressure shown above. Points for 0 psig. initial pressure were from Eastman Kodak Co. Data for propane are actually for acetone and toluene

which have similar burning rates. At right, results of closed vessel tests by Creech compared with present investigation. Details next page.

Bursting Disk Material	Vent Circle Diameter, In.	Disk Thickness, In.	Static Burst Pressure, Psig.	Dynamic Burst Pressure, Psig.	Maximum Explosion Pressure, Psig.	Max. Expl. Press., Al Disk, Same Strength, Psig.
Aluminum, 2S-O.....	4.00	0.0060	64.5	73	190	...
Aluminum, 2S-O.....	4.00	0.0170	153	169	223	...
Aluminum, 2S-O.....	4.00	0.0310	272	267	330	...
Brass, Spring temper.....	4.00	0.0080	183	187	258	267
Copper, electrolytic.....	2.50	0.0027	63.8	71	260	265
Monel, full hard.....	2.50	0.0020	84.6	84	251	274

HOW RUPTURE DISKS OF OTHER METALS COMPARED WITH ALUMINUM

Difference in max. explosion pressure between the three other metals and aluminum is as would be expected from their relative ductility. Differences not statistically significant, are small enough

to permit data derived with aluminum disks to be applied to other metals. Difference in ratios of dynamic burst pressure to static also insignificant.

Test Explosions, Evaluations . . .

Vented Explosions With 5% Propane, 95% Air Comparison of data from Creech, F. M. Labs

1. Vent ratio 0.28 sq. ft. per 100 cu. ft. vol.

Creech: Static burst pressure. 66 psig; initial press.
60 psig; Ratio explosive press./initial press. 4.4
F. M. Labs: Ratio explosive press./initial 7.6

2. Vent ratio 1.1 sq. ft. per 100 cu. ft. vol.

Creech: Static burst press. 75 psig; initial press.
65 psig; Ratio 3.31
F. M. Labs: Ratio explosive press./initial 5.8

3. Vent ratio 2.5 sq. ft. per 100 cu. ft. vol.

Creech: Static burst press. 85 psig; initial press.
71 psig; Ratio explosive press./initial 2.46
F. M. Labs: Ratio explosive press./initial 3.9

* Data are computed for vent ratios shown and for 65 psig.
disk strength and initial pressure of 60 psig.

Closed Vessel Tests—5% Propane, 95% Air, 45 Psig. Comparison of data from Creech, F. M. Labs

Max. Explosion Pressure, Psig.

	Test 1	Test 2	Test 3	Test 4	Test 5
Creech, L/D 5.0:	495	385	425	495	495
F. M. Labs, L/D 1.54:	530	505	475	470	465

Max. Rate of Pressure Rise, Psi./Sec.

	Test 1	Test 2	Test 3	Test 4	Test 5
Creech, L/D 5.50:	1,850	1,830	1,355	1,860	1,860
F. M. Labs, L/D 1.54:	42,200	34,900	36,400	23,000	16,500

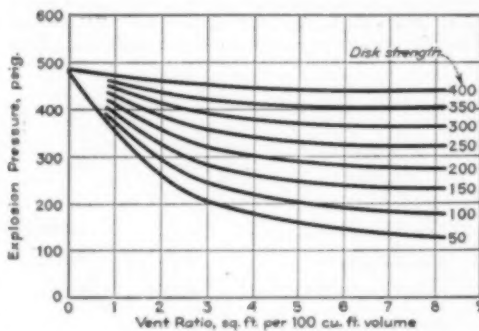
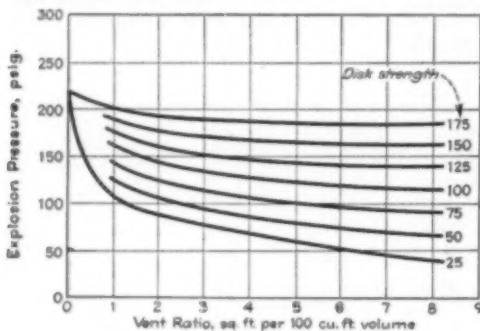
HOW PREVIOUS RESULTS COMPARED WITH PRESENT . . .

The tests made by Creech, using propane-air mixtures, were conducted in a container 2 ft. in diameter and 10 ft. long. There were three spark plugs for simultaneous ignition at 3 points along the container so the L/D ratio would be about 1.7 if all were used or 5.0 if only the one near the end was used. Pressures were measured at three points along the container using engine indicators of the conventional type. Results of the closed vessel tests in comparison with those of the present investigation are shown above. Note that the maximum explosion pressures are in reasonably close agreement but that the rate-of-pressure rise of the present investigation is very much greater. A small part of this difference is undoubtedly due to the greater L/D of Creech's container but the greater part is due to the difference in method of pressure measurement. The electronic gage has a natural

frequency of many tens of thousands of cycles per sec. and, therefore, can follow the rapid pressure changes much more closely than the engine indicator which has a natural frequency in the hundreds of cycles per sec.

Comparison of tests using bursting disks can be made at initial pressures higher than those of the present investigation and not enough tests were made to show the difference in effect of disks of different strengths. However, comparisons of ratios of initial and explosion pressures show a much greater effectiveness for a given vent ratio for Creech's data than indicated by our data. Again, this is due to the method of pressure measurement since the speed of response of the engine indicator is too slow to accurately follow the rapid pressure change and record the true maximum pressure. Table above gives the data for comparison.

Test Explosions, Practical Application of Results . . .



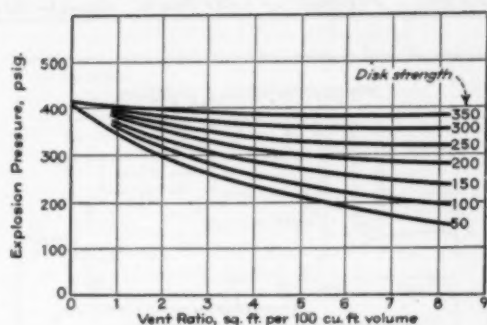
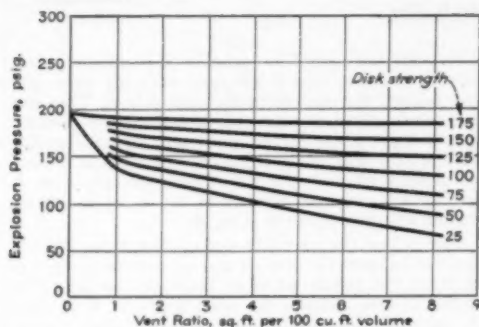
HOW 5% PROPANE-AIR REACTED TO SPECIFIC DISK STRENGTHS, VENT RATIOS.

Left, 15 psig., initial. Right 45 psig. initial pressures.

For practical use in design, results of the explosion research are presented above and on next page. Each graph covers all data for one gas and one initial pressure and consists of curves showing the relationship between explosion and vent ratio for various disk strengths. For example, graph for H₂-air at initial

pressure of 15 psig. shows that the max. explosion pressure that will occur in a vessel with no vent ratio (0.0) is 198 psig. If a vent ratio of 5 sq. ft. for each 100 cu. ft. of vessel volume is provided and equipped with a disk having a static burst strength of 25 psig., the explosion pressure will not exceed 90 psig.

Evaluations, cont.



HOW 40% HYDROGEN-AIR REACTED TO SPECIFIC DISK STRENGTHS, VENT RATIOS.
Left, 15 Psig., initial. Right, 45 Psig. initial pressures.

How the Test Explosion Data Can Help You Design Safer Closed Vessels

These fundamental data plus good judgment and extrapolation where permissible should enable you to solve most problems of explosive gases in closed vessels safely and economically.

When it is not practical to use a single large disk because of space limitations or the impracticability of obtaining the required strength in a large diameter disk, a number of smaller disks of the required strength totaling the required area can be used. This is because, while for any given volume and disk strength the explosion pressure varies with the disk area, tests with varying volumes show that in general it is not the area alone that determines the explosion pressure but the ratio of vent area to volume.

Since the graphs were derived from tests of two gases at two initial pressures, good judgment will be required in their application to protection problems. Naturally, very few such problems will involve materials or conditions exactly equivalent to the test conditions. However, it is possible, by proper selection of one graph or a combination of two graphs, to apply the derived data to most protection problems that may be presented. One general rule should be noted in determining whether to apply the data for hydrogen or propane to the problem at hand. Since hydrogen's rapid burning rate is not widely met in other gases, the hydrogen data should be used for problems involving hydrogen or any mixture of combustible gases containing more than 20 percent hydrogen. The data for propane should be applied to all materials having moderate or slower burning rates such as organic solvent vapors. If there is doubt of the characteristics of the material involved and no data are available to indicate the proper selection, the safest course is to apply the data for hydrogen.

The application of the explosion pressure-vent ratio relationship has certain limitations determined by the scope of the investigation from which it was derived

and the following specific instances are given to govern the use of the data developed.

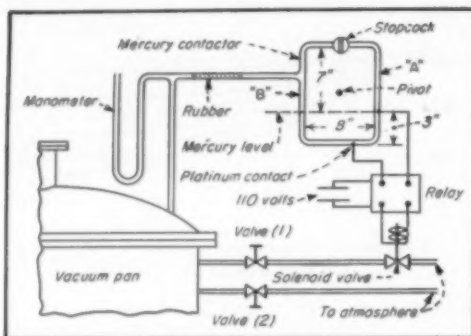
1. These design graphs are not applicable to pipelines or long tanks. In such containers a "detonation" can occur for which the maximum pressures are in the thousands of pounds per square inch and venting is totally ineffective. At atmospheric initial pressure the critical L/D ratio is about 60 which reduces to 30 at an initial pressure of 1 psig. Critical lengths for higher initial pressures have not been established. Within this limitation the explosion pressure decreases with increasing L/D ratio so the graphs may be safely used for containers of L/D ratio greater than that of the test container (1.54). For L/D ratios between 1.54 and 1.0 an added safety factor should be considered.

2. Initial operating pressures above the scope of the investigation are not covered by it, although straight line extrapolation of the data up to 60 psig is probably safe. For initial pressures below 15 psig, straight line extrapolation to 0 psig. can be made with safety.

3. For temperatures much higher than the range of the investigation (50 to 90 deg. F.) the data should be applied with caution. As the temperature increases, the quantities, by weight, of combustibles decrease, other things being equal. At the same time, the initial energy level increases with the result that it is not known specifically how extreme temperatures affect explosion pressure or ventability.

4. The data apply to vents having an unobstructed discharge to atmosphere (after the disk bursts). That is, they are not applicable to vents discharging into ducts or other confining spaces.

5. Since an explosion vent is a method of spreading out a quantity of energy which would be harmful if confined, caution should be employed in determining where that energy can be spent safely. The placement of vents should be such that their discharge would not be directed at flimsy construction such as thin partitions, glass windows, etc. Nor should they be directed in a manner such that personnel would normally be within the discharge path while the hazard exists.



Manostat Gives Close Control of Pressure in Vacuum Pan

ARTHUR W. WERRY, Junior Chemical Engineer, Amino Division, International Minerals & Chemical Corp., San Jose, Calif.

June Contest Prize Winner

Close control of vacuum was necessary during a crystallization study using a pilot-plant vacuum pan. The pan had an 8-cu. ft. volume and was evacuated to an absolute pressure of 9 to 10 cm. of mercury by a two-stage steam jet ejector. Initially, the pressure was controlled by letting air into the pan through a needle valve. However, despite constant attention, there was often a 5-mm. variation from the desired pressure.

A manostat was made which gave continuous control within 1 mm. Hg of the desired pressure and required no change in the vacuum pan's piping. The control consists of a solenoid valve, a relay, and a mercury contactor. It is shown diagrammatically in the sketch. The solenoid valve used is the 1/2-in. size, 110-v., 60-cycle Type B Aktomatic valve, manufactured by the Aktomatic Valve Co., Indianapolis, Ind. This valve is designed for water service and its solenoid therefore has sufficient power to shut off against the pressure difference of 15 psi. between the two sides of the valve. The relay is a 110-v., 60-cycle, Type STH, manufactured by H-B Instrument Co., Philadelphia. It is connected as shown in the sketch. The mercury contactor is made from 6-mm. borosilicate glass tubing with platinum wire sealed in the glass as contacts.

To place the control in operation the stopcock in the mercury contactor loop is left open until the steam jets have reduced the pressure to the desired level. Then the stopcock is closed so that the desired control pressure exists in leg A of the mercury contactor. The vacuum pan pressure then exists in leg B. Any variation of the vacuum pan pressure will cause the level of the mercury to vary. A decrease will cause the mercury to rise in leg B and an increase will cause it to rise in leg A.

Here is how the controller works: The steam jets will continue to lower the pressure making the mercury rise in leg B of the switch, so as to break the contact. The broken contact activates the relay, which in turn opens the solenoid valve admitting air into the vacuum system. The air increases the pan pressure and forces the mercury back up leg A of the switch, remaking the contact so as to close the solenoid valve. Once again the steam jets lower the pressure and the cycle is repeated, so that the pan pressure continually surges up and down.

The magnitude of the surges is largely dependent on the rate of pressure decrease by the jets and pressure increase by air admittance. A too rapid pressure increase or decrease causes the mercury in the switch to bounce or overshoot. Valve (1) is used to throttle down the air intake through the solenoid and acts as a fine adjustment. Valve (2), a needle valve, serves as a coarse adjustment and is opened to admit enough air to give approximately the desired pan pressure. Proper adjustment of valves (1) and (2) will lengthen the on-off cycle of the solenoid valve and limit total pressure variation measured on the manometer to less than 1 mm. Hg. An alternative for valve (2) could be the lowering of the steam supply to the ejectors.

The mercury contactor is secured to a plywood board which is mounted on a central bolt or pivot. Setting the desired pressure is simple with the pivot arrangement, because the level of the mercury in relation to the upper contact can be changed by rotating the entire switch. Thus, the desired pressure does not have to be attained exactly before the stopcock is closed. In fact, rotation of the switch will easily correct a 15 to 20-mm. error in the setting. Also, the control pressure can easily be changed over a range of 30 mm. without opening the stopcock. Since excessive vibration of the mercury contactor will cause the solenoid valve to chatter, the switch should be solidly mounted.

Although the manostat described here has been used on a relatively small piece of apparatus, it should work equally as well on large equipment.

★ July Contest Prize Winner

"Quick Calculator for Evaporation Lost, Blow-down and Make-up in Cooling Towers."

A prize of \$50 in cash will be awarded to Robert L. Ahlness, chemical engineer, Phillips Chemical Co., Philrich Branch, Borger, Texas. The prize winning entry will appear in the October issue.

\$50 PRIZE FOR A GOOD IDEA—Until further notice the Editors of *Chemical Engineering* will award \$50 cash each

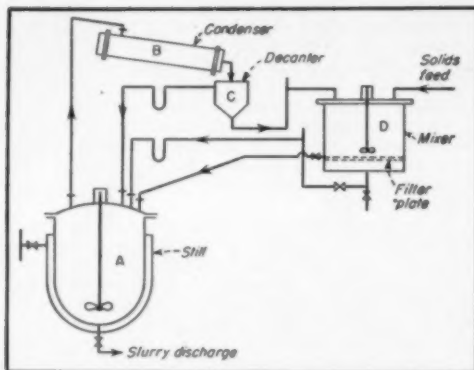
month to the author of the best short article received that month and accepted for publication in the *Plant Notebook*.

The winner each month will be announced in the issue of the next month, e.g., the August winner will be announced in September and his article published in October. Judges will be the editors of *Chemical Engineering*. Non-winning articles submitted for this contest will be published if acceptable at space rates.

HOW TO ENTER CONTEST—Any reader of *Chemical Engineering*, other than

a McGraw-Hill employee, may submit as many entries for this contest as he wishes. Acceptable material must be previously unpublished and should be short, preferably not over 500 words, but illustrated if possible.

Articles may deal with any sort of plant or production "kink" or short-cut that will be of interest to chemical engineers or others in the process industries. Also, novel means of presenting useful data are acceptable. Address *Plant Notebook* Editor, *Chemical Engineering*, 330 West 42nd St., New York 18, N. Y.



Equipment Hook-Up Serves for Both Extraction and Automatic Feed

P. P. JONES, Chemical Engineer, Twickenham, Middlesex, England.

The equipment arrangement illustrated above was developed for use in pharmaceutical manufacture but should also work well in many chemical plant applications. It can be used both for extraction and as a continuous automatic feeder.

As an Extractor—It is often necessary to extract a valuable constituent from a crude drug, or mixture of chemicals, with a solvent. This entails six stages: (1) Mixing of the crude material with solvent, (2) filtration of the slurry to remove the residue, (3) precipitation of the pure chemical by addition of water to the solvent solution, (4) filtration of the slurry to remove the precipitate, (5) distillation of the filtrate to recover solvent, and (6) recovery of solvent from the residue left in mixer.

The arrangement in the sketch enables the complete process to be carried out under closed conditions with economy in labor. The solvent and crude solid are mixed in D and the solution percolates through the coarse filter plate into the still A which contains boiling water. The solvent is evaporated as an azeotrope with the water vapor, while the chemical extracted from D is precipitated. The azeotrope condensing in B is separated into two layers in the decanter. The water layer returns directly to the still, while the solvent layer runs back into the mixer where it dissolves more of the constituent from the suspended solid.

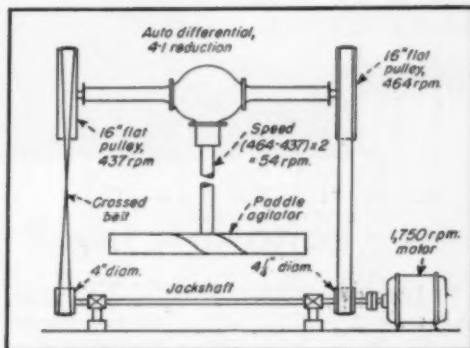
When the solid is fully extracted, the mixer is isolated and the residual solvent in the still distilled off, leaving an aqueous slurry of the required chemical ready for filtration. When this slurry has been removed from the still, the solvent containing the residue in the mixer is run down and the solvent recovered by distillation, after which the residue is dumped to waste. The solvent distilled is collected in the mixer ready for the next batch of crude material.

Although this illustration assumes the use of a solvent immiscible with water, the method has been used with acetone for extraction of a toxic chemical which was soluble in 80 mol percent acetone, but insoluble in 30 mol percent solution. In this case 80 percent acetone was fed into the mixer, while 30 percent solution was run into the still. On distillation, the 30 percent acetone produced a distillate of 80 percent acetone which extracted more of the constituent in the mixer and displaced an

equal volume into the still, where the acetone content was reduced to 30 percent, causing the solid content to be precipitated.

As an Automatic Feed Device—The use of the arrangement as an automatic feed device is best illustrated by an example:

An organic chemical is to be oxidized by means of an inorganic oxidizing agent. The organic chemical is dissolved or suspended in a solvent such as ether, benzene, carbon tetrachloride, etc., in still A and heated under reflux. Water is placed in mixer D and an excess of the oxidizing agent added so that a suspension of the agent is obtained. The solution percolates through the filter plate and overflows into the reaction mixture in still A, where the agent reacts and the water evaporates as an azeotrope and separates into two layers in decanter C. The solvent returns directly to the still, and the water layer returns to the mixer to dissolve more of the oxidation mixture and displace an equal quantity of solution into still A. A steady rate of feed is therefore maintained the only addition required being solid oxidant to mixer D. Meanwhile, the solvent solution of oxidized organic chemical can be removed periodically and fresh solution run into the still.



Auto Differential Serves as Slow-Speed Mixer Drive

ROBERT L. MILLER, Northern Ohio Engineering Co., Barberton, Ohio.

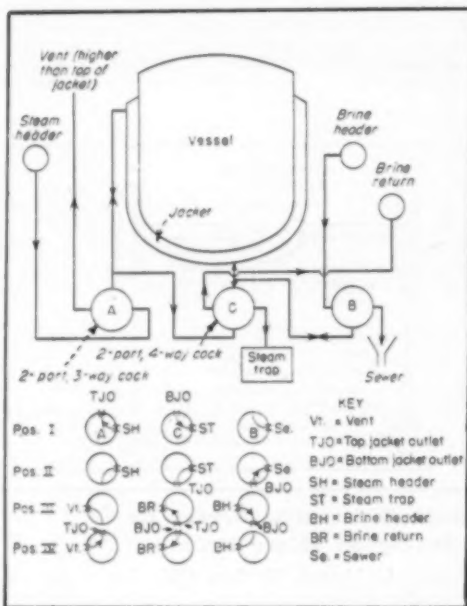
(NOTE: Despite the fact that there is some similarity between the method suggested by Mr. Miller, and the article by Olav Flatheim, of Norway, on p. 132 of our April issue, the present article was not inspired by the earlier one. Mr. Miller's contribution was received well ahead of the appearance of Mr. Flatheim's paper.—EDITOR.)

Slow-speed drive equipment is sometimes needed in a hurry. Often, when it is for experimental use, the purchase of new equipment may not be justified until the final requirements are known. In such a case it is often feasible to "rob the junk pile," with the possibility of securing very interesting results. An automobile differential as a speed reducer for an agitator is one example. One way to hook it up is shown in the sketch.

One property of a differential is that, if one of the (normal) output shafts A is driven forward, while the other B is driven backward at the same speed, there will be no rotation of the (normal) input shaft C. If then

shaft A is driven forward at a slightly greater speed than the backward speed of the other input shaft B, a net motion will be transmitted to the (normal) input shaft C. The ring-gear speed will be half the difference. Since the usual ratio of drive pinion to ring gear in an automobile differential is about 1 to 4, then the speed of shaft C is four times that of the ring gear, or twice the difference in speed of shafts A and B.

In designing such a drive the belt width must be determined by the tension. Although both belt tensions will be about the same, the tension will be increased by the reversing action of the opposite wheel. For the transmission of 1 hp. the use of 2-in. belts should be sufficient. I do not recommend a drive of this sort for heavy-duty production work, since it violates some important principles of power transmission, but it can be an extremely handy idea for experimental installations.



Foolproof Piping Layout for Jacket Steam and Brine Connections

J. CLARK KASKIE, Project Engineer, Monsanto Chemical Co., St. Louis, Mo.

The diagram above shows a piping layout for a jacketed process vessel which is to be heated with steam and later cooled with brine. Below the layout diagram is an operating schedule which shows how rotation of the three interlocked and interconnected plug cocks through their four positions enables the vessel to be heated and cooled without any possibility of making the wrong connections which might cause loss of brine to the sewer, or dilution of the brine with condensate.

Most arrangements for accomplishing these purposes which have been described in the literature are either cumbersome, or open to possible error. The present arrangement involves only the proper connection of the

vessel jacket with a steam header, steam trap, vent, sewer, and brine supply and return lines, through three two-port, 360-deg. cocks. Two of the cocks are of the three-way and one of the four-way type. The cocks are interlocked by means of a bar or a sprocket-chain drive so that all operate together throughout 360 deg. of rotation.

From the operating schedule it will be evident that in Position I steam is on the jacket, entering through cock A and the top jacket outlet. Condensate drains through the bottom jacket outlet via cock C to the trap. Cock B is closed.

In Position II the steam line is closed off by cock A, the bottom jacket outlet is opened to the sewer by means of cock B, while cock C has no function.

In Position III the steam line is closed off by cock A, is closed. Brine enters the bottom jacket outlet via cock B and returns to the brine circulating system from the top jacket outlet via cock C.

Position IV removes the brine from the jacket. The top of the jacket is vented to atmosphere via cock A, while brine leaves from the bottom jacket outlet via cock C to the brine return. Cock B is closed.

How to Measure Temperature of Flowing Liquids or Gases

HARRY A. HESS, Houston, Tex.

When it is necessary to measure the temperature of gas or liquid in a line where there is no thermometer well, a simple device may be fabricated to give readings identical with those in a thermometer well. A clamp is made which fits around the pipe and is held by two bolts, one through either side. The well for the thermometer is made by cutting a section out of a piece of rubber about $\frac{1}{8}$ in. thick and fastening it inside the clamp with two small stove bolts. At the bottom of the well, a drain cock is brazed in.

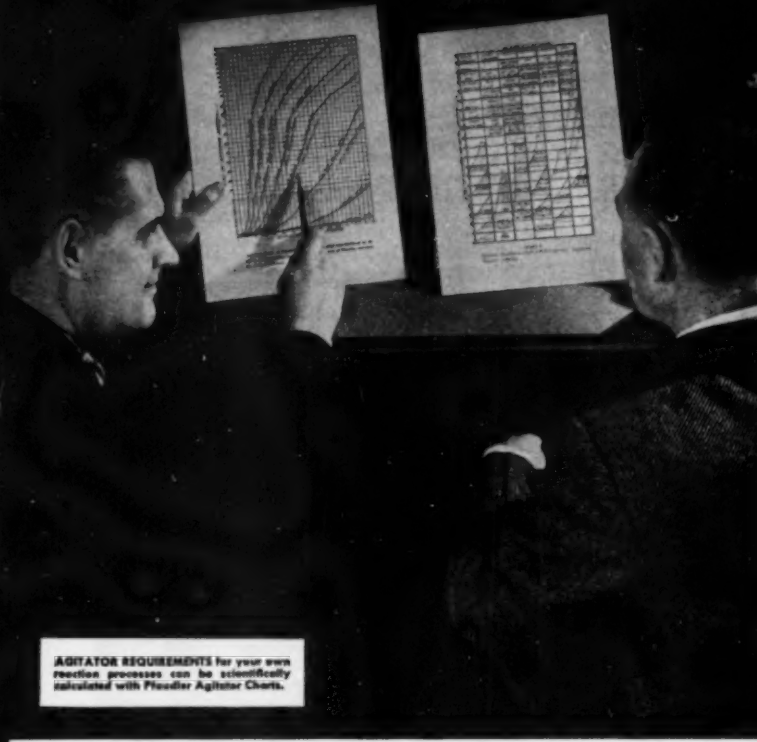
In operation, when it is desired to get the flowing temperature of a stream, the clamp is bolted on the line with the rubber against the line. Mercury is then poured into the opening between the clamp and the line, and the thermometer inserted into the mercury chamber.

When the clamp is to be moved, the mercury is drained from the chamber and kept in a bottle until ready for use again. This device not only gives good measurements, but also makes it easier to protect thermometers, as they can be dropped into the well instead of being fastened on the line, as is usual, with a cloth wrapped around a piece of earth.

Heat loss from the mercury reservoir is negligible because the rubber gasket completely surrounds the mercury chamber except where it is against the pipe, and a small hole at the drain cock.

This clamp may be changed slightly, for measuring temperature of a horizontal pipe, by installing the drain cock at right angles to its present position shown in the photo and re-designing the rubber gasket so that the hole will be at the lowest point of the reservoir.





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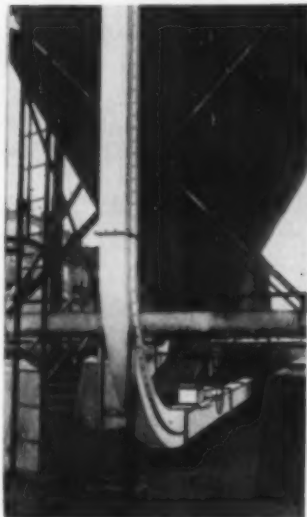
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Process Equipment News Edited by Cecil H. Chilton

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PACKAGING & HANDLING . . .



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SEPARATED RUN and side discharge are improvements over first Bulk-Flo.



LOOP-LOADING elevators, each about 65 ft. high, handling blended flour.

Bulk-Flo Proves Its Versatility

Link-Belt has continued to improve this conveyor-elevator, now observing its tenth anniversary.

(142A) Ten years ago this month Chem. & Met. carried its first brief mention (1 column, including picture) of Link-Belt's then new Bulk-Flo conveyor. Coming as it did when the nation was girding its loins for defense production, it is little wonder that this announcement generated inquiries from many engineers in the chemical processing industries. Very likely some of the early sales were made as the result of these inquiries.

The continuing and expanding popularity of the Bulk-Flo, however, is due not only to the success of early installations but also to the steady improvements in engineering and design

which have been made by Link-Belt. In its essential elements, the Bulk-Flo is the same as it was when first announced. But many new features and refinements, as well as types and sizes of machines, have since been developed.

Among these are the addition of a separated run design and the development of a side discharge head section. Originally there was only the combined run design and a front discharge section. Casing sections have been standardized for interchangeability. Drives have been improved, including a better shear pin hub or an Electrofluid drive requiring no shear pin.

The Bulk-Flo is best described as a feeder, conveyor, and elevator all combined in one compact unit. It is self-feeding, self-discharging, and largely self-cleaning. The conveying medium operates slowly within a dust-tight casing. It is designed for gentle handling of granular, crushed, or pulverized materials of a non-abrasive, non-corrosive nature. A list of products handled would run the gamut from aluminum hydrate to zinc sulphate. Bulk-Flos are especially well known in the soybean and cottonseed oil extraction industries.

Link-Belt's first bulletin on the Bulk-Flo consisted of four pages. The latest publication, running to 48 pages, is replete with installation views, construction data, engineering charts and tables. It points out that

the separated run design, one of the recent improvements, is better where you are handling materials containing lumps or where you require feed control and accessibility. The original combined run arrangement is still commonly used for handling fine, free-flowing materials.

SPARK-ENCLOSED FOR HAZARDOUS AREAS:

Fork Truck

(143A) Yale & Towne gasoline fork trucks are now available in spark enclosed models designed to provide the maximum possible safety for operation in hazardous areas. Although the manufacturer makes no claims that this equipment is explosion-proof, this truck is said to be as safe as possible with present materials and parts.

Protection has been accomplished by shielding the electrical equipment against sparking, by providing a water-tight exhaust manifold and a water-cooled muffler, and by using static conductive tires. Any sparks in the exhaust are quenched by directing them against a water spray.

All low-tension wires and cables are enclosed in flexible non-metallic tubing, with metal enclosures to receive wires and terminal connections. All high-tension wires are enclosed in flexible metal tubing that is grounded wherever wires pass through metal surfaces. Spark plugs also are enclosed.

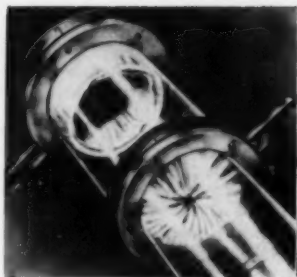


RESISTS MOISTURE AND CHEMICALS:

Package Liner

(143B) K-flex DV, a vinyl plastic film, is a new product of R. L. Kus & Co. It is said to be especially suitable as a container material for foods, pharmaceuticals, and many chemicals. It is being used as liners for paper-board and metal containers, as seals for closures of large drums and other containers, and in various assemblies where a water-resistant, flexible material is required.

This material will resist most substances, with the notable exception of animal and vegetable fats. The film can be heat sealed.



WORKS LIKE A CAMERA:

Bin Valve

(143C) A new valve for controlling the flow of bulk materials from bins, hoppers, and chutes is made by Syntrol Co. It uses a flexible diaphragm which operates like the iris diaphragm of a camera. Rotating the control lever increases or decreases the opening of the diaphragm and the flow of material.

Diaphragms can be made of cotton duck, nylon, rubber, or other material suitable to the application. Material passing through the valve does not come in contact with any moving metal parts. The fabric diaphragm will withstand many months of hard usage, it is said, and it may be replaced at low cost.

Valves are available in five different sizes to fit various openings up to 12 in.

SIMPLE AND VERSATILE:

Automatic Labeler

(143D) Simplicity of design is claimed by the MRM Co. for its new automatic labeler. An unskilled operator can make all necessary adjustments for varying container sizes, the company states.

The labeler will work with paper or metal foil labels, ranging in size from as small as a postage stamp up to 5x6 in., and will attach them to containers made of cardboard, tin, plastic, metal, or glass. A special control permits the machine to accommodate containers of any height.

A special MRM development is the method of applying glue to the label. Glue is applied away from the edges and spreads evenly when the wipers come in contact with the label, yet no glue will ooze beyond the edges.

Additional features are centralized lubrication, adjustable guide rails, and variable speed control. The machine occupies a floor space of approximately 3 x 7 1/2 ft., will handle up to 75 containers per min.

Equipment Cost Indexes

(Marshall and Stevens Indexes of Comparative Equipment Costs, 1926 = 100)

Industry	June 1950	Mar. 1951	June 1951
Average of all.....	143.1	181.2	180.9
Process Industries			
Cement mfg.	158.1	174.0	173.1
Chemical	166.1	182.0	181.1
Clay products	153.1	169.0	168.1
Glass mfg.	156.2	172.1	171.2
Paint mfg.	159.4	175.3	174.4
Paper mfg.	159.7	175.6	174.7
Petroleum ind.	162.5	178.4	177.5
Rubber ind.	164.9	180.8	179.9
Process ind. avgr.	163.5	179.4	178.5
Related Industries			
Elec. power equip.	167.7	183.6	182.7
Mining, milling	166.8	182.7	181.8
Refrigerating	179.4	201.0	200.5
Steam power	164.8	171.2	170.3

Compiled quarterly for March, June, September, and December of each year by Marshall and Stevens, evaluation engineers, Chicago and Los Angeles. Indexes are prepared for 47 different industries, from which the eight process and four related industries listed here are selected. Published each month with the latest available revision. For a description of the method of obtaining the index numbers see R. W. Stevens, *Chemical Engineering*, Nov. 1947, pp. 124-6. For a listing of annual averages since 1913 see *Chemical Engineering*, Feb. 1951, p. 158.



PROMOTES FLOW OF MATERIALS:

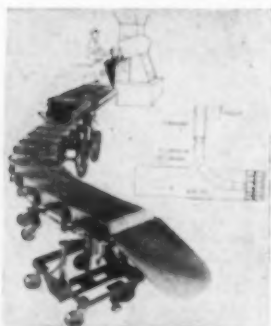
Bin Vibrator

(143E) Martin Engineering Co.'s new vibrator, known as the Vibrator, promotes the flow of such granular materials as cement, coal, flour, and soda ash toward the outlet of hoppers and bins. This device is said to be quiet in operation, self-lubricating, and to require no maintenance. It can be mounted in many different ways, comes in different sizes to allow for variations in operating conditions, materials, and equipment.

Materials Handling Box—"Phil-Box," collapsible, can be dumped by lift truck with revolving apron. Phillips Mine & Mill Supply Co. (143F)

Landing Mat—Made of rubber and Airfoam, cuts destructive handling losses when handling heavy or fragile articles. Goodyear Tire & Rubber Co. (143G)

Stacker—Combination fork lift-stacker and hand truck with elevating platform, operates from standard 6-v. automobile storage battery. Clark-Hopkins Equipment Corp. (143H) (Continued)



DELIVERS TO POINT OF LOADING:

Box Car Loader

(144A) A new power-driven telescoping box car loader developed by Flexoveyor Mfg. Co. transfers bags from the filling machine right to the point of loading inside the car. It can be bent into any curve up to a 90-deg. angle while under power and can go around the box car door and into the end of the car. Hand trucking is eliminated.

The conveying element consists of a series of endless spring belts which operate over grooved steel rollers. As loading progresses, the car loader telescopes under the filling machine conveyor and the flow of bags, up to 30 per min., continues without interruption. All changes in position can be made while the conveyor is running.

PIPE, VALVES, & FITTINGS

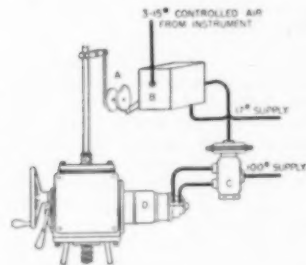
RESISTS ABRASION AND CORROSION:

Pinch Valve

(144B) A rubber pinch valve has been developed recently by U. S. Rubber Co. for use in pipelines carry-

ing abrasive and corrosive fluids. These valves are made of various types of rubber for various services, such as neoprene for oil resistance and butyl rubber for hot and severe acid conditions.

The flexibility of this valve offsets misalignment in pipes, absorbs vibration, eliminates water hammer, and provides a positive seal in the closed position. The valve needs no packing. Metal parts can be refitted to new valve bodies when necessary, reducing replacement costs.

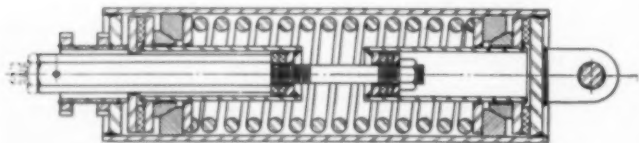


USES PLANT AIR SUPPLY:

Valve Operator

(144D) A new design of Cono-flow Corp.'s Rotomotor can be used for operation of catalyst slide valves on throttling control services. Operating entirely from normal plant air supply, this device replaces the more expensive hydraulic systems formerly required.

The Rotomotor operates through a gear drive and threaded stem. As shown in the diagram, a controlled low-pressure instrument air signal is converted into a 100-psi. impulse to the valve operator. Repositioning is accomplished by means of a device which permits long travels with accuracies of valve stem positioning to within 0.2 percent of the total valve stroke.



NON-RESONANT PIPING BRACE ELIMINATES SWING AND SWAY

(144C) The Bergen Genspring non-resonant sway brace is designed to prevent sway and control horizontal vibration of piping systems, without confining the natural thermal movement or adding objectionable stresses. A single compression spring is confined between two movable piston plates enclosed in a welded tubular housing. The spring is precompressed so that any tendency of the pipe to move in either direction will be resisted by a force equal to the initial loading of the sway brace. Normally no stress is exerted on the piping. Should the pipe sway or vibrate, however, the restoring force will increase as a direct function of the movement.



LIGHTER WALLS MEAN LESS COST:

Stainless Pipe

(144E) Carpenter Steel Co. is producing stainless tubing in sizes corresponding to standard pipe for the outside diameters but in wall thicknesses corresponding to Schedule 5. Because of the high strength-to-weight ratio of stainless steel, a light pipe is suitable for many uses. Schedule 5 pipe weighs much less than Schedule 40, is cheaper to purchase and easier to install. Its larger inside diameter provides increased fluid handling capacity.

Light wall stainless pipe provides an adequate margin of safety for the majority of process piping applications. Where high working pressures are encountered, however, Schedule 40 or heavier is recommended.

Corrosion resistance of Schedule 5 pipe is the same as that of other products made from the same alloys. Where severely corrosive conditions are encountered, however, it is sometimes advisable to use the heavier piping.

FOR HIGH PRESSURES:

Expansion Joint

(144F) You can now get expansion joints good for working pressures up to 5,500 psi. from Chicago Metal Hose Corp. These Flexoniflex units have stainless steel pressure bellows, single or multiple ply, lined or unlined with integral control rings and end sections. They are suitable for temperatures from sub-zero to 1,600 deg. F., it is claimed.

Sizes range from $\frac{3}{8}$ in. through 6 in. I.D., with larger sizes available on special order.

TAPERED OR STRAIGHT THREADS:

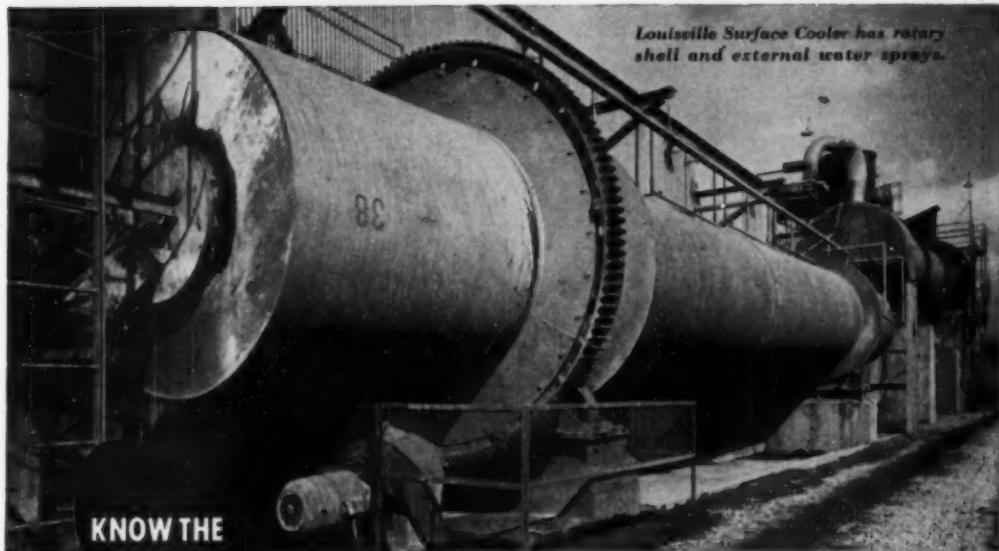
Pipe Threader

(144G) A new pipe threader recently introduced by Beaver Pipe Tools, is said to be the only tool of its kind that cuts either standard tapered pipe threads or straight electric conduit threads by a simple adjustment requiring no tools. This tool uses just one set of dies to thread

(Continued)



Louisville Cooler does satisfactory job at low cost for nationally known chemical manufacturer...



Louisville Surface Cooler has rotary shell and external water sprays.

KNOW THE RESULTS
before you buy!

... cooling lumpy calcined material from 1800° Fahr. to 150° Fahr. for further processing. Gentle mechanical handling required to minimize decrepitation.

Each Louisville cooler is "job-fitted" to your special problem—to make your cooling operations effective—to assure dependability of performance that will make the cooler operation pay.

Call in a Louisville engineer for a complete cooling survey. Based on his experience he will recommend one of the three standard Louisville types, a modification, or an entirely new design. The performance will be pre-determined. You'll know the results before you buy... and the results must be better! Write for complete information today.

3 types of Louisville Coolers

- Surface Cooler
- Water Tube Cooler
- Atmospheric Cooler

Other General American Equipment:

Turbo-Mixers, Evaporators, Thickeners, Dryers, Dewaterers, Towers, Tanks, Bins, Filters, Kilns, Pressure Vessels



Louisville Drying Machinery Unit

Over 50 years of creative drying engineering

GENERAL AMERICAN TRANSPORTATION CORPORATION

Dryer Sales Office: Hoffman Bldg., 139 So. Fourth Street
Louisville 2, Kentucky

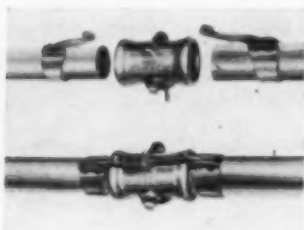
General Offices: 135 South La Salle Street, Chicago 90, Illinois

Offices in all principal cities

In Canada: Canadian Locomotive Company, Ltd.
Kingston, Ontario

four sizes—1, 1½, 2, and 2½-in.—and is fully adjustable for oversize or undersize threads to compensate for variations in fittings.

The threader has a cam-type universal self-centering chuck which centers the pipe accurately and insures straight pipelines. Die travel is always the same, resulting in uniform length of threads, whether standard, oversize, or undersize.



FOR PORTABLE OR TEMPORARY JOBS:

Pipe Coupling

(146A) One man can lay as much as 1,000 ft. of pipe per hr., it is claimed, using a new coupling put out by R. M. Wade & Co. The new coupling, known as the Quick-Lok, is built for plain end pipe; rolled, welded, or formed ends are not needed. A damaged end does not mean loss of a length of pipe or a welding job—just cut off the end, replace the ring and lock bar, and you have a connection as good as the original.

Couplings are tested to handle 300 psi. Sealing is accomplished by rubber or neoprene gaskets. The coupling can be used on oil, gas, or chemical lines just as well as with air and water.

Blind Valve—Combines spill-proof and self-aligning features with simplified three-bolt operation. Hamer Oil Tool Co. (146B)

Cast Steel Valves—In sizes ½ to 2 in., for high temperatures and high pressures. Walworth Co. (146C)

ELECTRICAL & MECHANICAL

FOR CORROSIVE ATMOSPHERES:

Coated Conduit

(146D) Republic Steel Corp. is now offering standard electrical metallic tubing to which a corrosion-resistant coating of polyethylene has been applied. Polyethylene was chosen for

the coating because of its excellent chemical, electrical, mechanical, and thermal properties. The coating is applied by the Dekoron process of the Samuel Moore Co. (*Chem. Eng.*, Feb. 1950, p. 158).

No special wrenches are needed for working this conduit. Any fractures of the coating made on the tube by extremely rough handling can be repaired by wrapping the section with a suitable plastic insulating tape. To couple two lengths of tubing, the plastic is stripped from the tube the necessary distance from each end, the joint is made with a coupling, and then the entire assembly at the joint is wrapped with plastic tape. The tubing can be readily bent using the next larger size standard bender.

USES A SELENIUM RECTIFIER:

Battery Charger

(146E) A new industrial battery charger for units up to 55 amp.-hr. capacity is available from Yale & Towne. Operating on the selenium rectifier principle, the new charger is designed to give simplified, maintenance-free operation, prolong battery life, and save power. These results are accomplished primarily by an automatic controller, which governs the amount and time of charge, and the complete lack of moving parts.

The new charger reduces the human element to a minimum. All you do is plug it in, set the clocks, and throw a switch. A dual clock control affords identical protection to both new and old batteries, whether fully or partially charged, in either cold or warm areas. Built-in temperature compensation provides the latter feature.

The charger is available for either lead-acid or nickel-alkaline batteries. It can be plugged into any standard 110-v., 60-cycle outlet.

USES A VIBRATING JET:

Vacuum Cleaner

(146F) A new industrial vacuum cleaner uses a vibrating air jet to create an agitating suction, carrying dirt and metal particles into a container. This agitating effect is said to be more efficient than conventional steady suction types because it will dislodge and collect particles that steady suction won't budge. The new cleaner, dubbed the Vibro-Pneumatic, is made by Patterson Products.

By operating a second of two fingertip control valves, you can create a vibrating external jet. This will dislodge particles from inaccessible places to spots where you can pick them up with the normal suction action.

The unit operates from any 80 psi. compressed air source. Air consumption varies from 2.7 to 7.7 cfm., depending upon which of three different orifices is used.

The operator carries the dirt collector on his back by means of a belt and harness assembly. The complete unit weighs only 7½ lb. Larger models using tanks from 20- to 55-gal. capacity can be obtained.



FOR ELECTROPLATING JOBS:

Rectifier

(146G) Electronic Rectifier Co. has brought out a new selenium rectifier, designed especially for the electroplating and electrochemical industries. This unit provides a full-wave rectifier circuit with voltage continuously variable from 0 to 8 v. d.c. at 150 amp. capacity, or 0 to 16 v. d.c. at 75 amp. capacity.

An accurately calibrated fully-magnetic circuit breaker gives full protection at all voltage settings, it is claimed. The selenium stacks are triple coated with synthetic enamel for lasting protection, even in corrosive plating room atmospheres. The unit measures 22 x 18 x 25 in., weighs 160 lb. The cabinet is arranged for wall, shelf, or floor mounting.

ELIMINATES TIME SCHEDULES:

Lighting Control

(146H) A new weatherproof illumination control has been announced by the Weston Electrical Instrument Corp. Known as Model 1089, it provides completely automatic on-off control of artificial lighting at predetermined light levels, thereby eliminating human judgment and arbitrary time schedules.

The unit, mounted in a standard weatherproof watt-hour meter glass case, consists of a stable dry-disk photocell, a sensitive relay which is

(Continued)

**MORE
RESISTANT
TO MORE
CHEMICALS**



**HARD RUBBER
AND PLASTICS**

HYDROFLUORIC ACID EYEWASH

for Television Tubes — pumped by ACE Hard Rubber

THIS special machine for washing television tubes uses 12% hydrofluoric acid as the cleansing reagent. The job of handling this tough corrosive was given to four ACE hard rubber pumps.

The remarkable part of this story is not that ACE stands up under hydro-

fluoric acid; that's commonplace! But the fact that the pumps are constantly switched on and off—twice a minute, 24 hours a day, six days a week—is remarkable. What better test could you devise for a well built acid pump?

We can supply you with rubber-protected tanks, pumps, piping, valves, fit-

tings, and utensils in standard or special constructions for complete chemical processing, storage, or circulating systems. Saran and Parian (polyethylene) pipe and fittings are also available. Write for "ACE Rubber Protection"—64 pages of catalog data you'll find valuable in your work.



Lightnin Mixers

BUILT FOR THE YEARS AHEAD

We are straining every facility to meet the tremendous demand for Lightnin Mixers, greater than ever before in our history.

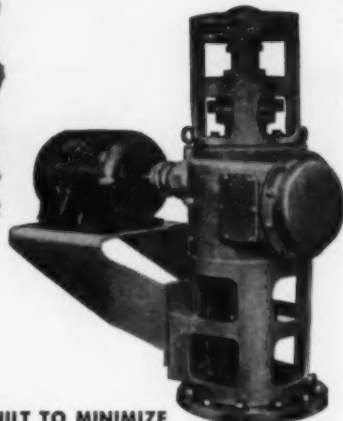
To insure that your fluid agitation will be just as efficient tomorrow, or ten years from now, as it is today, we are building every Lightnin Mixer to the same strict specifications as always.

Unfortunately, this means we must ask you to wait longer than usual for delivery. Our Materials Planning Department is actively engaged in anticipating your requirements so as to insure that there will be the least possible delay after your order is received. Check with us for latest delivery information.

The Lightnin Sales Engineer who services you will be glad to give you further information, and can suggest many ways to keep your present agitation equipment in service until the day your new Lightnin arrives. You will be glad you kept in touch with him.

BUILT TO MINIMIZE MIXER OBSOLESCENCE

Lightnin Model TEC heavy duty turbine agitator is designed to meet changing process requirements. It is quickly convertible from closed tank to open tank service. Shaft may be extended upward for bottom entering use. Sixteen standard AGMA speeds are quickly available from the same heavy duty drive, all with standard 1750 RPM motor.



LIGHTNIN PORTABLE MIXERS are used universally in process industries. Heavy Lightnins have been in continuous service 20 years and more.



LIGHTNIN TOP ENTERING AGITATOR (Model TEC) is 2 HP size, installed in pilot plant for Streptomycin production. Development work benefits from Lightnin versatility.



LIGHTNIN SIDE ENTERING MIXERS are favored by petroleum refiners and other large-tank users. They are easily re-packed from outside the tank, without draining the tank.

MIXING EQUIPMENT Co., Inc.

(MIXCO)

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- | | |
|---|---|
| <input type="checkbox"/> B-76 Side Entering Mixers | <input type="checkbox"/> DH-50 Laboratory Mixers |
| <input type="checkbox"/> B-78 Top Entering Mixers (Propeller Type) | <input type="checkbox"/> B-36 Condensed Catalog showing complete line |
| <input type="checkbox"/> B-89 Top Entering Mixers (Turbine and Paddle Type) | <input type="checkbox"/> B-75 Portable Mixers (Electric and Air Driven) |

Name

Title

Company

Address

City Zone State

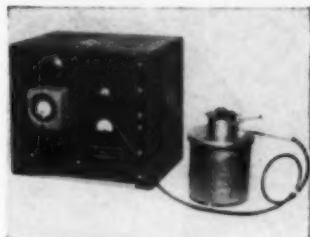
MAKERS OF

Lightnin Mixers



A COMPLETE LINE . . . UNEXCELLED TECHNOLOGY

operated directly by the photocell, a clock motor, mercury switch, and limit switch. It contains no phototubes or vacuum tubes which usually require frequent servicing and replacement. According to Weston, it will withstand adverse climatic conditions and will function perfectly at temperatures as high as 140 deg. F. and as low as -30 deg. F.



WITH WIDE FREQUENCY RANGE:

Ultrasonic Generator

(149A) Ultrasonic Engineering Co.'s generator contains a vacuum tube oscillator which, at full power, will develop about 500 watts of energy at 800 kc. This power is fed by means of a coaxial cable to a crystal transducer, mounted in an aluminum vessel. Crystals are available at frequencies from 450 to 2,000 kc.

Output power of the generator is continuously variable from zero to full by means of the knob at the lower left of the panel. Knob at the upper left is for adjusting the generator to new frequencies when crystals are changed.

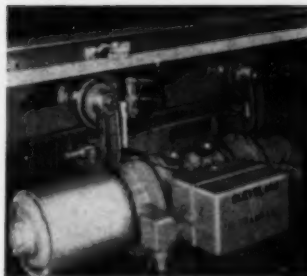
The transducer may be used as a continuous flow chamber or as a batch treatment vessel. Various accessories for holding samples and circulating cooling solutions are available. The instrument is equipped with a timer in order that repetitive dosages will be of uniform duration.

The model illustrated costs \$675. Additional transducer cases and accessories are extra.

Low-Pressure Cylinder—Hydraulic or pneumatic, operates at pressures below 110 psi. Hanna Engineering Works. (149B)

Variable Speed Drives—New Speed-Trols in 20- and 25-hp. ratings. Sterling Electric Motors. (149C)

Blacklight Lamp—Provides long wavelength ultraviolet light for leak detection with fluorescent chemicals. George W. Gates & Co. (149D)



FOR MAXIMUM SAFETY:

Crane Electrification

(149E) Cleveland Crane & Engineering Co. has announced a new type of electrification for overhead crane and tramrail systems especially designed to provide maximum safety. The development, known as Saf-Powr-Bar, consists of inverted U-shaped conductor bars inside of which operate sliding current collector shoes. This electrification arrangement may be applied to all new Cleveland tramrail systems, as well as to replacement on open-bar electrification.

Anticipating that within a few years the National Electric Code will make mandatory the adequate protection of electrification on overhead materials handling equipment, company engineers designed the Saf-Powr-Bar to prevent accidental contact of workers with an electrified conductor bar. The bar is enclosed by an insulated plastic covering. Sliding current collector shoes operating on a pantographic principle contact three sides of the bar. A diagonal spring provides upward pressure on the graphiter shoe while a torsion spring within a plastic housing causes pressure to be applied on both sides of the conductor bar.

INSTRUMENTATION

READS DIRECTLY IN CENTIPOISES:

Viscosity Recorder

(149F) Designed especially for the textile industry, the new Taylor size viscosity recorder is provided as a packaged panel unit with a recorder reading directly in centipoises. Here is how it works: A synchronous motor drives a positive displacement pump which forces the viscous fluid at a constant rate through a predetermined length of uniform diameter tube, one end of which is open to atmospheric pressure. As the viscosity changes, the differential pressure across the tube changes.

Taylor points out that this instrument is not readily adaptable to applications differing markedly from its original intended use, measuring size viscosity in textile mills. As experience with the new instrument accumulates, Taylor will no doubt be in a position at a later date to provide viscosity recorders for various applications in the chemical process industries.



WITH INTERCHANGEABLE ATTACHMENTS:

Portable Pyrometer

(149G) A new general-purpose, low-temperature portable pyrometer is now being made by the Claud S. Gordon Co. Known as Type LT-840 Xactemp, it is a self-contained instrument for rapid temperature determinations below 800 deg. F. Automatic cold-end compensation is provided. A choice of four calibrations allows the most effective use of the scale range desired.

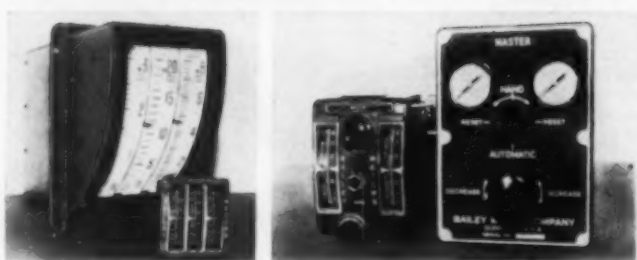
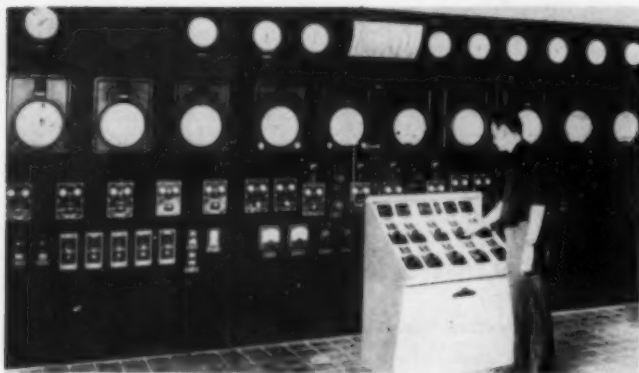
Available for use with the instrument are two needle thermocouples, a ribbon thermocouple, a surface thermocouple, and other specially designed thermocouples and extension arms. These attachments are easily interchangeable. They make it possible to measure the surface temperature of stationary and revolving rolls, flat and irregular surfaces, plastic materials, rubber, greases, and other semi-fluid materials.

The pyrometer, less thermocouples, sells for about \$50. The various thermocouples and extension arms are priced in the range of \$8-15 each.

Potentiometer—Converts a very small mechanical force into an electrical potential. Electro-Mec Laboratory. (149H)

Polarograph—For analysis of chemical compounds such as determining the presence of lead or zinc in rubber compounds. General Scientific Equipment Co. (149I)

(Continued)



MINIATURE CONTROL UNITS SAVE PANELBOARD SPACE

(150A) Bailey Meter Co.'s new Mini-Line instruments, described on p. 165 of our Feb. 1951 issue, are mounted on the bench panel above, measuring 3 ft. 6 in. high by 2 ft. 6 in. long. The bench panel provides the same measurement and control arrangement as the conventional vertical panel, which is 6½ ft. high and 15 ft. long. The lower views compare standard multi-point indicators and selector valves with their new Mini-Line counterparts.

ELIMINATES DUPLICATE INDICATORS:

Tachometer

(150B) A new Metron tachometer, by means of a selector knob, makes it possible to measure from one location and with one indicator the speeds of several machines. The indicator may be located up to 1,000 ft. from any of the machines.

A wide selection of full-scale markings is available, calibrated in any desired units. Calibrations can be adjusted in the field to accommodate extraordinary conditions.

MINIMUM BEARING FRICTION:

Level Control

(150C) The new Type 888 liquid level control, made by Black, Sivalis & Bryson, features a cone-point pivot said to reduce bearing friction to a minimum. Torque tube housing is removable and reversible without special tools and without dismantling the controller housing. The reversible feature permits installation of two

torque tube housings and two pilot or mercury switches. By this means you can obtain simultaneous liquid level control and alarm or emergency circuit operation.

WITH NEW MEASURING MECHANISM:

Electric Recorders

(150D) A new line of recording voltmeters and ammeters, identified as Series 500, is offered by the Bristol Co. These instruments make continuous records of voltage or current on 8-in. circular charts, similar to previous models. However, the new instruments feature an entirely new measuring mechanism and a number of other improvements. They are housed in compact die-cast aluminum alloy cases.

The new moving-iron measuring mechanism produces a high actuating torque at a low electrical burden. It has shock-protected precision stainless steel bearings, magnetic damping, and a locking device to prevent damage due to rough handling.

The recorders are furnished in a

variety of models for wall, surface, or flush mounting.

Running-Time Recorder—Records on and off time of machines in hr., min., and sec. Bristol Co. (150E)

Radiation Meters—Two models, one portable, the other, plug-in, for monitoring radioactivity in laboratories. Tracerlab, Inc. (150F)

Counter—Electronically operated, indicates total count, rate of count, and pre-determined count, up to 10,000 units per sec. General Control Co. (150G)

TEMPERATURE MEASUREMENT

JUST STICK 'EM TO THE SURFACE:

Resistance Thermometers

(150H) Stikon thermometers, made by Ruge-deForest, are said to be the world's smallest commercially available resistance thermometers. Type BN-1, for industrial uses, measures ½ in. by 1½ in. and is only 0.005 in. thick. Other types for research and testing are even tinier.

These thermometers are used for measuring surface temperatures ranging from -100 to +400 deg. F. The business end is a minute grid of nickel wire, uniformly drawn to 0.0008 in. diameter. Measurements are made with a resistance bridge, taking advantage of nickel's high coefficient of electrical resistivity.

Installation is simple—all you do is cement the Stikon to the surface whose temperature you wish to measure. Reference charts supplied with each Stikon make it easy to convert ohmmeter readings to deg. F. or C.

FIVE NEW ITEMS:

Pyrometer Supplies


(150I) Among a series of new pyrometer supplies recently developed by Minneapolis-Honeywell is a two-conductor, 24-gage copper-constantan thermocouple wire for low temperature applications. This wire is covered with moisture-proof polyvinyl chloride insulation. Field tests show a temperature range of -20 to +225 deg. F. Where flexing does not occur, the low limit is below -30 deg. F.

Another wire development is a 20-gage two-conductor insulated extension wire, with standard ISA wire

(Continued)

Autronic 9

A revolutionary new electronic control system for the Process Industries



You are cordially invited to inspect the new
Swartwout Autronic Control System for precise, automatic
measurement and control of temperature, pressure, level, and flow.

This compact electronic system is the ultimate in centralized
control. It will be publicly displayed for the first time
at the Sixth National Instrument Exhibit, Houston, Texas, from
September 10th to 14th, inclusive. We look forward to seeing you
at Booths 324-346. Or if you are unable to attend in person,
write for literature on the new Swartwout Autronic Control System.

Swartwout *Autronic* **CONTROL SYSTEM**

THE SWARTWOUT COMPANY, 18511 EUCLID AVENUE, CLEVELAND 12, OHIO
CHEMICAL ENGINEERING—August 1951

color coding in both iron-constantan and Chromel-Alumel components. Each wire is insulated with enamel and covered by wax-impregnated asbestos. The two conductors are covered over with a heavy Fiberglas braid.

Two more developments are concerned with temperature measurements in molten metals. A portable immersion, removable-tip thermocouple has been developed for measuring temperatures of molten steel in foundry holding and transfer ladles. A new cast iron closed end protecting tube for molten aluminum applications is claimed to provide a service life several times that of former models.

The last of the announced developments is a heat-resisting protecting tube which is suitable for use with heat-treating furnaces, salt and lead hardening baths, and gas burners. It is made in 1-in. pipe size. A temperature of 1,800 deg. F. is the recommended high for this new tube.



Heated Screen Avoids Blinding

(152C) The screens in the above pictures are both handling the same material—a moist clay used in brick and tile manufacture. The screen at the left is unheated; note the almost total blinding of the mesh. The one at the right is heated; note the almost complete absence of blinding.

Here's how this heating is done: A specially designed step-down transformer converts 220-, 440-, or 550-v. alternating current to a low voltage which is delivered through high-ampere cables to special bus bars which extend the full length of the screen on each side. The screen wire offers resistance to flow of current, just enough to produce the desired heating effect. This heat reduces the moisture content of the material as it passes over the mesh.

This arrangement, according to its developers, F. R. Hannon & Sons, increases screen capacity as much as 50 percent, depending on the nature and moisture content of the material being screened. Another advantage is the elimination of the beating which would ordinarily be required to keep the screen open. This latter feature reduces operating labor and increases screen life.

Although originally developed for use with clay, the Hannon electric screen heater is said to be finding increasing use in handling sand, coal, lime, ores, and chemicals which contain moisture. Applications are limited, however, to materials which are not readily flammable or explosive and are non-conductors.

The design of the transformer is rugged and fool-proof. Installation can be made by any competent plant electrician. Voltage and temperatures developed present no hazard from fire or electrical shock.

OPERATION BOOTSTRAP:

Rotary Kilns

(152D) Two rotary kilns, said to be the largest ever to be engineered and manufactured west of the Mississippi, are being fabricated by Standard Steel Corp. These kilns, 10 ft. in diameter by 150 ft. long, will be installed as part of the \$2,500,000 manganese ore plant at the site of the old Three Kids mine near Henderson, Nev. Construction of the kilns will require approximately 400 tons of steel.

ATTACH TO YOUR WATER TAP:

Demineralizer

(152E) Recently developed by Enley Products, the Demon demineralizer is an inexpensive unit for consumers of small quantities of demineralized water. Selling at about \$15 each, these units can be put into use merely by attaching to your regular water tap. A single cartridge produces up to 120 gal. of chemically pure water; replacement cartridges are available.

The Demon employs Rohm & Haas Amberlite resins. The resins change color from blue to yellow as they be-

(Continued)

PROCESSING

TUNGSTEN CARBIDE RESISTS WEAR:

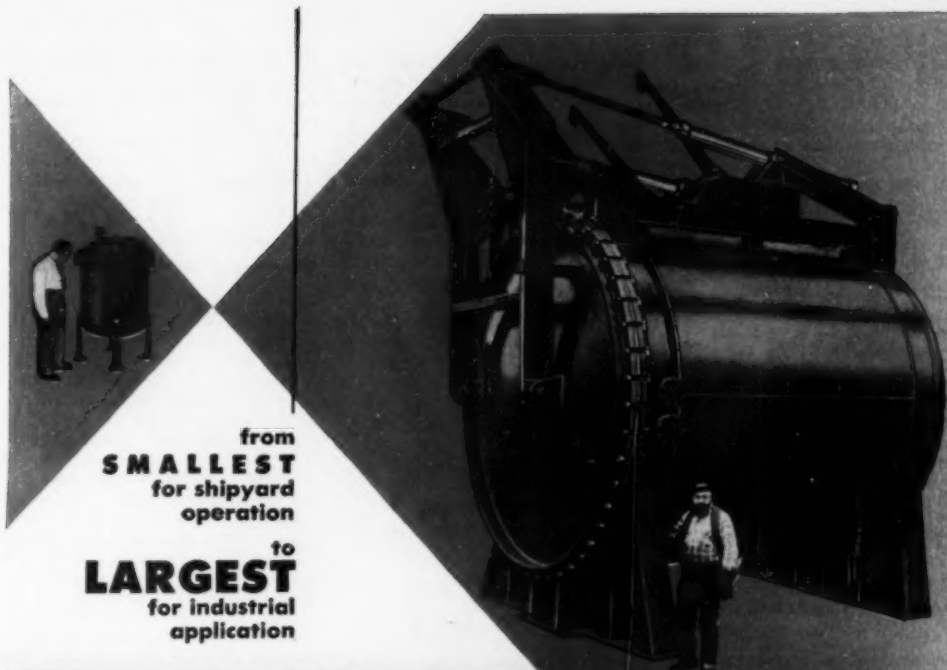
Pulverizer

(152A) A new Riley Stoker Corp. pulverizer uses pulverizing elements faced with tungsten carbide, providing long life and sustained fineness of product. Designed primarily for crushing coal, the pulverizer rejects tramp iron, iron pyrites, and other hard foreign substances in the coal, preventing any materials from entering the pulverizer section which could cause damage.

In a new crusher-dryer section where coal is crushed to a fine granular state (approximately 40 percent through a 50-mesh screen), free moisture is evaporated from the coal. Coal then enters the pulverizing section, where 95 percent of the work is done, completely free of moisture which would affect pulverizer performance and capacity.

The new pulverizer, says Riley, has an unusually high capacity per unit of floor space and height, permitting installation under crowded space conditions. A machine having a capacity of 20 tons per hr. with 50 grindability high-moisture coal is only 11 ft. 9 in. wide, 7 ft. deep, and 7 ft. 6 in. high.

Freeze-Drying Unit—Model 203F, compact, factory-assembled, for drying vitamins and other biologicals. F. J. Stokes Machine Co. (152B)



from
SMALLEST
 for shipyard
 operation
 to
LARGEST
 for industrial
 application

ACME IMPREGNATORS ARE MORE EFFICIENT!

The small impregnator illustrated above at the left measures only 36" in diameter. It is one of a battery of four especially designed and precision-built by Acme to meet specific conditions for a dock installation.

The large Horizontal Jacketed Impregnator, measuring 11'-4" in diameter and 17'-6" in length, has a volume of 11,000 gallons. It operates at 150 p.s.i. working pressure and full vacuum at a temperature of 650°F. An efficient hydraulic mechanism provides smooth operation of the 5-ton door.

Whether your processing problem is a midget or a giant in size—whether it encompasses engineering and design or fabrication alone—at Acme you will find the skill, the equipment and experience to insure the most economical solution.



NEW EQUIPMENT, cont. . .

come exhausted. When the exhaustion line reaches the bottom of the cartridge, the cartridge is removed and replaced. Built-in Fiberglas filters remove solid particles from the water.



SMOOTH-WORKING TRIO:

Chemical Feeder

(154A) Tank, agitator, and pump are combined in a chemical feed unit recently announced by Neptune Pump Mfg. Co. The unit is designed for pressures up to 1,000 p.s.i. and capacities up to 15 gph. It may be put into operation simply by providing the connecting piping and plugging in the motor to a suitable source of power.

PUMPS & COMPRESSORS

LARGE HORSEPOWER UNITS:

Engine Compressors

(154B) Clark Bros. has added several large horsepower units to its line of gas engine-driven compressors. These machines are designed to deliver more horsepower and capacity per unit of space and cost.

They are all rated at 2,000 or more bhp. The first to be developed was the HBA-10, 2,200 bhp., 300 rpm., 17-in. bore by 17-in. stroke. The HLA-8 and HLA-10 use strokes of 19 in. to get more horsepower and more capacity in the same compact space. The larger unit, the HLA-10, is rated at 2,500 hp. It has five compressor cylinders instead of the four cylinders used with the HLA-8, weighs 210,000 lb.

WITH ADJUSTABLE AIR PEELER:

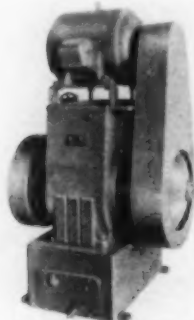
Centrifugal Pump

(154C) Chain Belt Co. has just placed on the market a new line of self-priming centrifugal pumps.

These pumps are designed primarily for use with portable gasoline engines, but may also be driven by electric motors.

In common with other self-priming centrifugal pumps, they are provided with an air peeler. These new pumps, however, have adjustable peelers which, it is claimed, will maintain maximum priming efficiencies during the entire life. They are also provided with replaceable wearing plates and special shaft seals.

The new Rex pumps range in size from 1½ in. up to 6 in. Capacities range from 4,000 to 90,000 gph.



LARGEST YET:

High-Vacuum Pump

(154D) A new Stokes Microvac pump, Model 812-F, has a capacity of 500 cfm. The largest of this series, it operates at 390 rpm. with a 25-hp. motor. It weighs 2,400 lb., stands 76 in. high, and occupies a floor space 36 by 38 in.

Like its smaller predecessors in the Microvac line, the new pump operates at a high volumetric efficiency because the air is completely discharged at each stroke, with no chance for re-expansion.

PRESSURE & FLOW MEASUREMENT

WITH LOGARITHMIC SCALE:

Wind Velocity Recorder

(154E) A new Hastings wind velocity recorder indicates and records wind velocities between 0 and 200 mph. A two-part logarithmic scale ranges from 0 to 50 mph. and from 5 to 200 mph. You can switch from one range to the other either manually or automatically.

The instrument is furnished with either a directional or a horizontally

non-directional probe. These probes are of the thermopile type, with no moving parts, and are temperature compensated.

The instrument operates on 110 v., 60-cycle current. Voltage regulation is incorporated in the unit to eliminate the effect of line voltage variations.

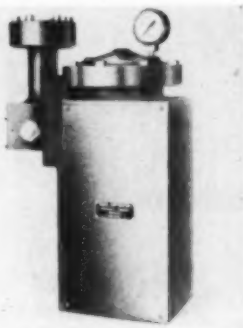
FOR CROSS-COUNTRY PIPELINES:

Pressure Measurement

(154F) Baldwin strain gage pressure cells will measure and control pressures in the Plantation pipeline system between Baton Rouge, La., and Charlotte, N. C. The new installation is being applied both to new and existing lines in this system.

Pressure sensitive tubes are connected into the pressure system. A resistance wire strain gage is bonded on the outside of each tube. Slight expansion or contraction of the tube, caused by pressure changes, stretches or relaxes the fine wire grids of the gage, increasing or decreasing its electrical resistance. This change of resistance is transmitted to the instrument panel by a low-voltage line carrying less than 0.1 amp. and using less than 1 w. of energy.

Of nearly 200 pressure cells to be used, those used with indicating instruments will have capacities ranging from 600 to 1,500 psi., and those used for automatic control will be of 1,000 psi. capacity.



FOR HIGH PRESSURES:

Flow Transmitter

(154G) Hagan Corp. has announced a new flow transmitter, operating on the force balance principle, which can be used at static pressures up to 1,500 psi. The unit receives a differential pressure from a primary flow measuring device and translates this into a proportional output pressure sent via a single ¼-in. pipe to a remote recording, indicating, or con-

(Continued)

The Ljungstrom Air Preheater Can Help You



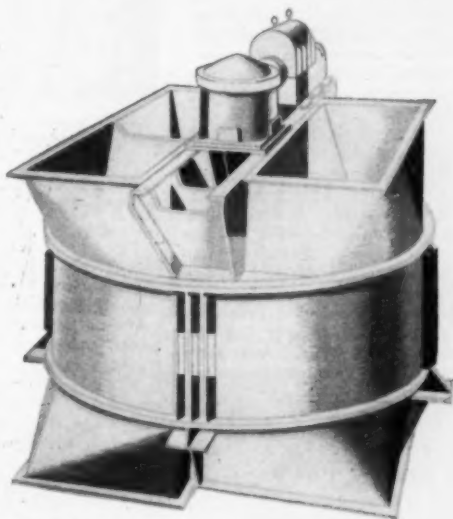
To improve combustion of low-grade fuels

To raise the level of heat recovery

To save materials in plant design

If you want to improve the combustion of low-grade fuels . . . raise the level of heat recovery . . . conserve critical materials in plant design . . . you or your consultants can make profitable use of Preheater experience. Let our specialists tell you more about the Ljungstrom Air Preheater, and the outstanding job it has done for hundreds of America's leading industries and public utilities, where the need for preheated air from 300F to approximately 1200F was part of their problem. Our engineers are ready to work with you in applying the Ljungstrom to your own heat recovery problem.

The Ljungstrom operates on the continuous regenerative counterflow principle. The heat transfer surfaces in the rotor act as heat accumulators. As the rotor revolves the heat is transferred from the waste gases to the incoming cold air.

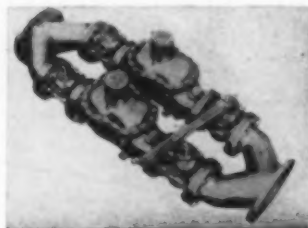


THE AIR PREHEATER CORPORATION

60 East 42nd Street, New York 17, N. Y.

trolling instrument. Interchangeable measuring elements cover a continuous range of pressure differentials from 5.5 in. water up to 100 psi.

Output loading pressure has a maximum value of either 30 or 60 psi. Accuracy of measurement is within 1 percent of full scale reading, claims Hagan.



PERMITS SERVICING WITHOUT SHUTDOWN:

Compound Meter

(156A) A compound meter manifold unit recently introduced by Rockwell Mfg. Co. consists of two single register compound meters in combination with four lubricated plug valves and two 8-in. reducing manifolds. It is so arranged that one side may be shut down at a time without interruption of service. By isolating one side, a meter can be removed and exchanged for one serviced and calibrated in the shop, while flow continues through the other meter.

It is also possible, with this assembly, to check-test a meter in place without a break in service. To make such a test, the discharge valve of the meter may be shut off and the test plug in the meter body used for the test run.

The manifold assembly has the same flow capacity—1,600 gpm.—as the American Water Works Association requirement for a single 8-in. compound meter.

MATERIALS OF CONSTRUCTION

CUTS DOWN ON PREPARATIONS:

Bronze Welding Rod

(156B) EutecRod 148 FC, a new bronze welding rod put out by Eutectic Welding Alloys Corp., is covered with a new specially developed flux which makes this rod suitable for use with old, corroded, or dirty cast iron. The new rod provides an extra thin initial tinning action and is said

to flow where directed without extensive chamfering, even on butt joints. Eutectic says that this rod will eliminate the pre-welding preparations required by conventional rods. Tensile strength is reported at 55,000 psi. and Brinell hardness at 75 to 120.

LIGHT AND INERT:

Polyethylene Tank Liners

(156C) Completely welded polyethylene tank liners, both removable and permanent types, can be furnished by American Agile Corp. Made

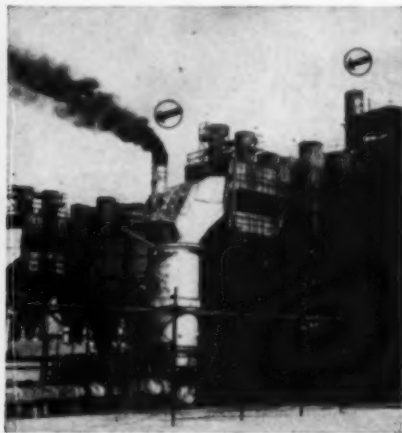
in all sizes and shapes with wall thicknesses up to 1 in., they are fabricated to the customer's specifications by gas welding. Complete fabrication may be done at the company's plant or at the customer's plant, depending upon the size and complexity of design.

Tank liners can be furnished with polyethylene drains and flanges. Tanks so fitted can be directly connected to existing pipelines and installations.

An important feature of polyethylene liners is their light weight—they weigh but 1/13 the weight of lead of the same thickness.



ORLON bags are being installed in this dust filter.



COMPARE the two stack effluents, shown by arrows—the before and after of this story.

Orlon Filters Recover Waste

(156D) Bag filters for dust collection and recovery are finding new fields of usefulness, thanks to the development of synthetic fibers with improved properties. Du Pont's Orlon acrylic fiber, for example, because of its heat and acid resistance, high strength, and good flexing characteristics, is being successfully used in applications heretofore considered outside the bag filter's bailiwick.

One such application is the recovery of a new type of carbon black by Cabot Carbon Co. This material is composed of such extremely fine particles that the plant was recovering only 60 to 70 percent of the product. Since this was a difficult product to make and yields were so low, Cabot was selling the black at a loss.

Enter Orlon, in the form of a bag filter unit made by American Wheelabrator. This unit is now recovering practically 100 percent of this rather

expensive product. The recent installation of six additional units at other Cabot plants is testimony to Cabot's happiness over the results.

Successful use of Orlon bag filters has also been reported by a large producer of metals. Waste gas from the roasters, containing sulphur, zinc, lead, and cadmium compounds, is handled by the filters. The presence of moisture often causes an acidic condition. Because of Orlon's superiority, the firm is said to be converting its entire installation of 10,000 bags to the new fiber.

The recovery of valuable materials is only part of the story—the longer life of Orlon bags under severe conditions results in direct savings in operating costs. Labor cost of changing bags is reduced and equipment on-stream efficiency is increased. And, of course, air pollution is effectively eliminated.

(Continued)



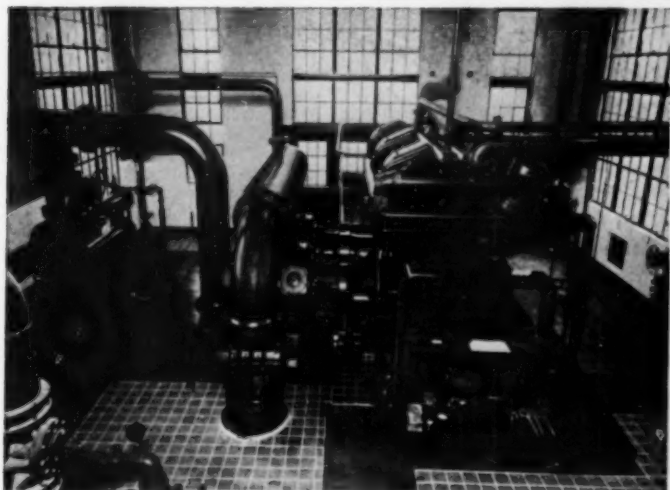
The Harrisburg Gas Co. HAS GONE A LONG WAY IN THE PAST 100 YEARS

...with the help of dependable I-R equipment like this

Erected in 1850 at Harrisburg, Pa., the original plant of The Harrisburg Gas Co. had a maximum output of 25,000 cubic feet per day. Now the company's combined facilities, including a unit under construction, are rated at more than 35,000,000 cubic feet per day! What's more, growth has continually kept pace with the latest technological advances in the industry. At Steelton, for example, a new catalytic cracking plant has recently been completed—one of the first of its type in the United States.

During the past century of progress, The Harrisburg Gas Co. has always placed the emphasis on *continuity of service*, which can be secured only by *quality of construction*. That's one of the reasons why it has repeatedly specified Ingersoll-Rand Compressors and Blowers for all major installations.

The *proved dependability*, operating economy and low-cost maintenance of I-R equipment have become almost a tradition in the gas industry. It took years of experience to build up this reputation—experience in the design, manufacture and application of air and gas handling equipment to meet the rapidly changing needs of the industry. All of this experience is at your disposal—no farther away than your nearest I-R representative.



This Ingersoll-Rand KVG, 600-hp gas-engine-driven compressor at the Steelton station can pump 335,000 cubic feet of gas hourly, at 34 psi pressure. A duplicate KVG is currently being

installed. At the same station are two XVG gas-engine-driven compressors, each having a capacity of 120,000 cfm.



I-R centrifugal blower, supplying combustion air for oil and gas burners in catalytic cracking furnace. Another I-R blower is used for pressure boosting.



I-R steam-driven compressor, of 277 cfm capacity, supplying process air to the cracking furnace at 30 psi.



Two XPV steam-driven 150,000 cfm compressors handling high-pressure distribution for the Harrisburg station.



Two more I-R steam-driven compressors on high-pressure distribution at Harrisburg. The unit at the right has been in service since 1914.



I-R Type 30 compressor supplying 60-psi air for operating the cracking-plant control instruments.

Ingersoll-Rand

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COMPRESSORS • AIR TOOLS • ROCK DRILLS • TURBO BLOWERS • CONDENSERS • CENTRIFUGAL PUMPS • DIESEL AND GAS ENGINES

CHEMICAL ENGINEERING—August 1951

157

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TURN**



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**DARNELL
CASTERS**

- Reduce Floor Wear to a minimum.
- Increase efficiency of employees.
- Eliminate wracking of equipment.
- Save time, speed up production.

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NEW EQUIPMENT, CONT. . .

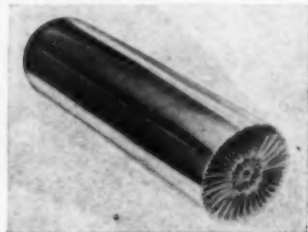
COMFORTABLE, CORROSION-RESISTANT:

Floor Tile

(158A) U. S. Stoneware Co. is now making Plascor floor tile from Tygon plastic and resin-impregnated cork, molded under heat and pressure. Tygon gives Plascor its chemical resistance, toughness, and long life. The cork content makes it quiet and comfortable.

Plascor is claimed to be the first resilient floor tile combining in one material chemical resistance, quietness, comfort, long life, and attractiveness. These properties should make it especially suitable for use in chemical laboratories.

HEATING



LOW PRESSURE DROP:

Heat-Transfer Tube

(158B) Recently announced by the Heat-X-Changer Co. is the extended-surface heat-transfer tube pictured above. It is designed for a high rate of heat transfer with minimum pressure drop.

This product is available with either one or two finned annular spaces, with outer tubes ranging from $\frac{1}{8}$ in. to 2 $\frac{1}{2}$ in. and inner tubes $\frac{1}{8}$ in. to $\frac{3}{4}$ in. Standard tubes are made of copper, with copper or aluminum fins. Other materials may be obtained on special order. Tubes are available in lengths up to 10 ft. in 6-in. increments.

SIMPLIFIES PIPING:

Elbow Nozzle

(158C) Hauck Mfg. Co. has combined a flame-retaining gas-burning nozzle with a long sweep elbow into a single unit. The new unit is said to simplify piping of nozzle and air-gas mixer, thereby reducing installation costs.

These nozzles will retain the flame at their tips under usual operating conditions. Part of the air-gas mixture is taken from the supply and burned in a recess around the same burner opening, thus lighting the main flame.

This design permits a wider range of mixture pressures without blowing the flame off the burner tip or back-firing.



FOR LOWER PRESSURES:

Electric Boilers

(158D) Livingstone Engineering Co. has added to its line of Speedylectric boilers two new models for lower pressures. Model LP-1 $\frac{1}{4}$ is rated at 15 psi. and Model 400-1 $\frac{1}{4}$ at 50 psi. Other units in this series are good for 100, 200, and 250 psi.

Available for 220-, 440-, or 550-v. single phase power, these boilers deliver 45 lb. steam per hr. with 15 kw. input. Heat is generated by resistance of the boiler water to the flow of current between metal electrodes. There are no coils to burn out, no tubes to scale, no open flame or fire hazard, and no low water danger. If there is no water in the boiler, no current flows and the power input stops.

Pressures are adjustable within the capacity range of the boiler. Automatic control adjusts current consumption to maintain the desired steam output and pressure.

SAFETY

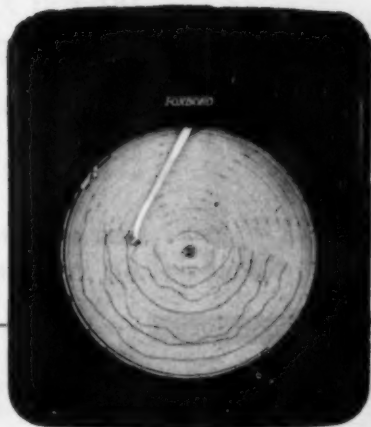
YOU CAN BREATHE MORE EASILY NOW:

Respirator

(158E) The new Compact Confo respirator features a mineral wool filter which is said to require less than half the filter area and offer only half the breathing resistance of previous models with the same dust collecting efficiency. This new respirator has been designed by Mines Safety Appliance Co. to protect workers against toxic or fibrosis-producing dusts. The extra fine filter fibers are reported to be effective as dust collectors under any type of atmospheric condition. (Continued)

6 point Temperature Recorder

with single-point vigilance



THE MULTI-RECORD DYNALOG*

By recording up-to-6 points in rapid succession, the Foxboro Multi-Record Dynalog gives the immediate warning of temperature drifts that you'd expect only from single-point recorders . . . all 6 records appear like unbroken lines! Check these outstanding features:

- High speed recording—6 seconds between prints for maximum continuity of records
- Each record in a distinctive, non-smudging color
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*Reg. U. S. Pat. Off.



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(see opposite page)



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FOR INSTANCE,
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designed the plant, supplied the equipment and supervised the initial operation of the biggest ion-exchange installation ever installed for purification of waste fruit juices?



a two-stage D-I System for the recovery and purification of a new organic chemical; process developed by the client... equipment supplied by Dorrr?



ideal for the production of 100 to 1000 gallons per hour of high-purity water at low cost... as demonstrated at an East Coast pharmaceutical plant where D-I water is costing but 13 cents per 1000 gallons?



These are typical examples of our work in ion-exchange... indicative of the scope of our service and equipment range. If you are currently exploring the possibilities of ion-exchange for new processes or those already established, we will be glad to work with you on any basis you desire. And our ion-exchange facilities are backed by solid experience in chemical engineering.

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NEW EQUIPMENT, CONT. . .



PERMITS NORMAL CONVERSATION:

Ear Protector

(160A) A new sonic ear valve that will protect the eardrum from loud harmful noises and yet admit conversational tones is now available from Sigma Engineering Co. Designated the Lee Sonic Ear Valve, it is a precision-built mechanical ear protector which fits comfortably into the ear canal. Sigma points out that this device is a valve—a sonic filter—and not an ear plug.

The Ear-Valv eliminates the harmful effect of sudden blast-type noises on the eardrums and also eliminates the force caused by the vacuum following an explosion, which is often more harmful to the eardrum than the explosive force itself. It is made of non-corrosive metal and soft rubber, light in weight, yet sturdy enough to withstand dropping upon a hard surface. List price is about \$4 per pair.

HOSE PROVIDES FLEXIBILITY:

Fire Extinguisher

(160B) A 4-lb. dry chemical fire extinguisher with a rubber hose has been placed on the market by Ansul Chemical Co. Provision of the hose, along with an improved nozzle, makes this extinguisher flexible in fighting all types of fires.

Operating range of the Ansul 4-B extinguisher is 12 to 15 ft. Dry chemical ejected through a self-closing nozzle produces a fan-shaped stream pattern characteristic of Ansul hand extinguishers.

Salt Tablet Dispenser—Holds 750 ten-grain tablets, priced at \$2.50. General Scientific Equipment. (160C)

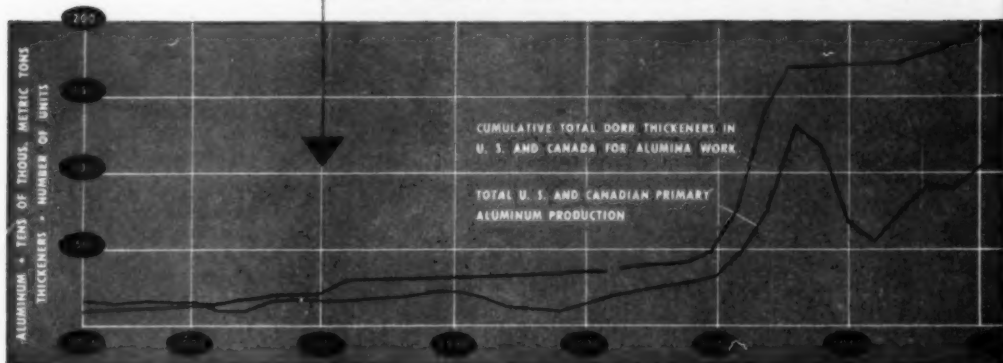
Salt Tablet Dispenser—Plastic expendable container with 1,000 tablets, sealed at factory to prevent contamination. Standard Safety Equipment Co. (160D)

Gas-Tight Goggle—Rubber frame goggle, when perfectly fitted provides a gas-tight seal. American Optical Co. (160E)

—End



**if it's
thickeners
you need...
check
the
record
of the
Aluminum
industry**



1916 marked the installation of the first Dorr Thickener in the aluminum industry. Today, nearly 200 Dorr...the majority big-capacity tray units...serve the industry in the United States and Canada alone. Elsewhere in the world, better than 200 additional units are installed for the processing of alumina prior to its reduction to metal.

We have gained invaluable experience in the handling of chemical processing problems from this long association. And the aluminum industry is but one of the many that pioneered with Dorr Thickeners...and has shown continuing faith in their use.

If it's Thickeners you need, regardless of size, type or use, it will pay to check Dorr...the oldest manufacturer of sedimentation equipment *with the newest ideas.*



WORLD - WIDE RESEARCH - ENGINEERING - EQUIPMENT

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NOW new phosphate coating process, above, extends lubrication limits to make tube drawing 60 percent more efficient.



SOON it will make cold extrusion a commercial reality. Forming this billet took half the time and steel as old methods.

New Process, Chemical Ingredients and Technical Service—One Package

New metal treating chemical process does away with lubrication limits in cold working of steel. The chemicals and the engineers who know most about using them are readily available. (162A)

A complete line of products have been integrated in one process to produce a heat resistant lubricating surface chemically interlocked with steel. Known as the Foscoat Process, its heart is Foscoat itself, a phosphate coating which can be applied by immersion, flooding or spraying. This highly absorbent coating functions as a host for Foslube, an organic lubricant which reacts chemically with the coating in addition to being physically adsorbed and absorbed. To insure proper pre-cleaning and preparation for cold working, the complete process was worked out to include pickling and special alkaline cleaners, designated as Fosclean products.

A joint development of Pennsylvania Salt Mfg. Co. and Heintz Mfg. Co., the process is of immediate importance in such cold working applications as tube drawing, wire drawing, deep drawing, deep stamping. Economies resulting from the improvement in lubrication include: elimination of intermediate press operations, annealing and chemical treating operations; additional reduced consumption of chemicals because of compatibility;

increased production with existing equipment; savings in metal or reduction in scrap losses.

The efficiency of the new phosphate coating chemical bath has been successfully demonstrated in cold extrusion. Its widespread use only awaits the general availability of press equipment of sufficient size designed to take advantage of the raised lubrication limits. And with cold extrusion will come really substantial savings. (In fact, it was the cold extrusion angle—to improve earlier German work—that originally prompted the research on the new coating.) It can often eliminate the necessity for forging or up-setting of heated billets. These operations generally require a starting billet twice the size of that necessary for cold extrusion. The forged shape usually requires extensive scrap-generating machining.

Also, savings are possible by adapting plain carbon steel for applications ordinarily requiring steels containing critical and expensive alloying materials. Cold extrusion involves the concept of steel as a plastic material which, when the barriers of friction

are sufficiently extended, will flow under pressure. Stressing the steel in compression—in contrast to cold drawing where forming is performed by stressing the metal in tension—permits a drastic kneading action that increases strength characteristics considerably, with but slight effect on ductility.

Pennsalt has formed a special group to supply plant users with the complete integrated process, all necessary chemical ingredients, technical service for the entire cold working operation. The technical service phase includes layout and equipment design as well as mechanical engineering service on tool and die design to insure optimum lubrication. Heintz engineers are cooperating with Pennsalt in the latter phases of this service.

Copolymer Resins

Four new series of resins for manufacturers of adhesives, protective metal and paper coatings, lacquers. (162B)

American Polymer Corp. has announced the availability of several new resins classed as: Polycryl, Acrypol, Butacryl, Dermine.

The Polycryls consist of six acrylic resin solutions. Their numbers and solvents are: 413, methyl ethyl ketone; 414, cellosolve acetate; 427, toluene; 415, ethyl acetate; 419, toluene; 420,

mineral thinner. They make clear, glossy, non-oxidizing coatings; can also be used as bases for compounding adhesives. They have good electrical properties, do not discolor at high temperatures, have low pigment reactivity, are water, alcohol, alkali and acid resistant.

The Acrypols are stable copolymer dispersions of the higher acrylic esters. On drying, these products or mixtures thereof yield flexible, non-oxidizable films with moderate to considerable tack. Designated 434 and 435, they contain no added plasticizers and so are free of embrittlement and variable film properties due to plasticizer migration or volatilization.

The Butacryls, Nos. 422 and 423, are stable aqueous dispersions of butadiene copolymerized with various acrylic monomers. Recommended to the paper, textile and leather industries as coatings and saturants, their films are flexible, non-oxidizing and oil-resistant.

The Dermines are acrylic copolymer emulsions varying from tough clear films to rubbery properties. They find use as pigment binders for leather finishing and paper coatings.

Joint Sealing Compound

Holds "sneaky" chemicals like benzene, propane, chloroform. (163A)

Leak Lock has been introduced by Highside Chemicals Co., Clifton, N. J., to hold many chemicals that usually find a way through joint sealing compounds.

The especially formulated polyhydroxylated plastic base resists these chemicals (including carbon tetrachloride, trichloroethylene, methylchloride, jet engine fuels) and still remains pliable enough to permit easy disassembly. It can be used for threaded joints, flanged surfaces and tank interiors.

Nickel-Plating Process

For buffed brass, steel and copper, unpolished cold-rolled steel, fine finished steel, dull steel, and die castings. (163B)

Chemists of the Gill Corp., Cleveland, have developed Smoothex Nickel Brightener Process consisting of new organic addition agents: Smoothex 400, a primary brightener in powder form; Smoothex 50, a secondary brightener in liquid form; Smoothex 200, a wetting agent in paste form that helps to control pitting. By using the three of them in a standard Watts

IN BRIEF—A capsulated listing of this month's newsworthy products

It's New . . .

Phosphate Coating
Copolymer Resins
Joint-Sealing Compound
Nickel-Plating Process
Fire Fighting Foam
Insecticide
Two Brominators
Forging Scale Remover
Two Stearates
Resins
Synthetic Rubber Latex
Pyrolidine
Paint
Coating for Magnesium
Gasket Material

It's Good For . . .

Extending lubrication limits in cold workings of steel. . . 163A
Non-Oxidizing coatings, bases for adhesives. . . 162B
Resisting chemicals which often go through seals. . . 163A
Producing brightness from beginning of cycle. . . 163B
Extinguishing fires caused by polar solvents. . . 163C
Killing mites—and it's non-toxic. . . 163D
Allylic bromination; steroids production. . . 163E
Eliminating blasting operations; lowering costs. . . 164A
Lubrication when used in coatings, plastics. . . 164B
Resorcinol-glue applications—and cost is lower. . . 164C
Replacing natural rubber latex on a large scale. . . 164D
Formation of rubber accelerators, surfactants, drugs. . . 165A
Preventing or stopping rust action. . . 165B
Corrosion, heat, abrasion resistance. . . 168A
Use with gasoline or oil. . . 169A

See Page . . .

Don't Forget: Reader service postcard inside back cover will bring you more information. Use these key numbers

formula, brightness is obtained right from the start of the plating cycle and luster intensity gains until maximum brilliance is reached.

Other processes are easily converted to Smoothex. Conversion consist of carbon filtrations, high pH treatment and addition of Smoothex materials to the treated bath.

Fire Fighting Foam

Unlike usual mechanical foams, it extinguishes polar solvent fires as well as those caused by petroleum products. (163C)

Described as a mechanical foam having universal application, Aer-O-Foam "99" will function effectively in many spots formerly reserved for special chemical foam powder. National Foam System has successfully run NBFU-approved tests on fires involving alcohols, ethers, esters and related oxygen bearing polar solvents.

It is a liquid—non-corrosive, free flowing and mobile at temperatures as low as 10 deg. F. It can be used with existing 6 percent mechanical foam-making proportioning devices. These provide an average expansion of 10.

In action it moves out quickly onto a blazing surface in a smothering mass of tight-knit, air-filled bubbles. Any break in the mass quickly rescals. It adheres to and insulates all types of surfaces.

Cost per gallon of foam produced is less than for a chemical foam system. Aer-O-Foam "99" is available in 5-gal. cans.

Insecticide

Non-toxic, mite-killer; boon to fruit growers. (163D)

United States Rubber Co.'s Naugatuck chemical division has just made Aramite available to commercial grow-

ers. It has been successfully tested against mites throughout the country by agricultural experiment stations.

Aramite's chemical construction is 2-(p-tert-butylphenoxy) isopropyl 2-chloroethyl sulphite. It is being sold as a wettable powder with recommended dosages of between 1 and 2 lb. per 100 gal. of water, depending upon type of application.

It can be applied by spray duster, speed sprayer, hand sprayer, boom applicator or by helicopter. Acute toxicity tests have been conducted on the chemical without harmful effects to animals. No irritation of the skin has been encountered from contact.

It is compatible with nicotine sulphate, toxaphene, lead arsenate, Phygon-XL, ferbam, and wettable powders of DDT, chlordane and benzene hexachloride. It is not compatible with bordeaux mixture or lime.

Two Brominators

For specific allylic brominating action. Available in experimental and pilot quantities. (163E)

The products are 3-bromo-5,5-dimethylhydantoin and 1,3-dibromo-5,5-dimethylhydantoin. Arapahoe Chemicals has named them Monobromantoin and Dibromantoin, respectively.

They react very much like NBS (N-bromosuccinimide) already offered by Arapahoe. They differ little from each other in their general reactivity but the greater solubility of Monobromantoin and the higher content of active bromine (56 percent) in Dibromantoin suggest special applications for each. Steroids are one field in which major uses are anticipated.

Besides their specific allylic brominating action, they brominate side-chain methylene groups in preference to the ring and are expected to be specific oxidizing agents.

(Continued)



Forging, right, shows how scale forms. Center, after standard heat treating and water quench; scale must be shot-blasted off. Left, after SR-4 bath, no scale.

Chemical Bath Blasts Scale

New chemical in quench water removes forging scale. Eliminates need of sand blasting; cuts cost 90 percent. (164A)

Forging scale is an iron oxide which is harder than steel. If it is not removed completely, it interferes with machine tool setting and quickly wears down cutting tools.

Now the Pennsylvania Salt Mfg. Co. is marketing a pre-heat chemical bath which actually blasts the scale from all surfaces during quenching. The descaling bath is made up of a new product, Pennsalt SR-4, dissolved in weak muriatic acid and water. It requires no heating and is made up in ordinary rubber lined tanks. Dipping baskets can be made of simple sheet iron. Parts covered with forging scale are immersed in the bath for 5 min. and then may be placed directly into heat treating furnaces or can be stored for later heat treating.

The forgings are heat treated at a temperature range from 1,500 to 1,600 deg. F. and soaked at temperature for the minimum time permissible. An additional saving results from the fact that the forgings can be heat treated in a non-reducing atmosphere or without a prepared atmosphere.

Following the heating the forgings are water quenched and tempered. In conventional operations, the tenacious furnace scale is then removed by expensive sand- or shot-blasting, but with the use of the SR-4 bath, this process is completely eliminated in most operations. Use of SR-4 operations resulted in a 90 percent reduction in descaling costs and in the elimination of costly blasting equipment and resulting delays due to down-time for maintenance of this equipment.

The product was developed from a

practice originated at the Toledo, Ohio, and Pottstown, Pa., plants of the Spicer Mfg. Division of the Dana Corp. Pennsalt and Spicer researchers cooperated in the development and in the laboratory and plant tests. Satisfactory results have been obtained in SR-4 descaling of plain carbon steel grades and some SAE alloy steels. The product is currently undergoing field tests in several other industrial plants.

Two Stearates

Butyl stearate to lubricate a surface; lead stearate for internal lubrication. (164B)

Butyl stearate is a colorless, oily liquid which solidifies at temperatures below 66 deg. F. Relatively non-volatile, it is compatible with many organic materials used in the protective coating, plastics, textiles, paper, ink, lubricating, cosmetic and metal industries.

Witco Chemical Co. makes it to exact specifications. Witco C-1 (cosmetic) grade meets all requirements where a colorless butyl stearate is desired while the Witco T-1 (technical) grade is available to industrial users to whom color is less important.

Its ability to lubricate a surface by gradual exudation or sweating out and leaving an invisible film, thus preventing adhesion, has made it of importance in label, paper, and cable lacquers. In the plastic finishing industries, its anti-block quality is useful when working with lacquered surfaces. The metal industries find use for butyl stearate in stripping compositions since it combats corrosion and is non-staining to metals.

Witco also has available two lead stearates: No. 300 (fused), and No. 303 (fused-oiled). They can be used as internal lubricants and processing aids

in plastics, especially as lubricant-stabilizers for polyvinyl chloride plastics.

No. 300 is a finely ground white powder made by the fusion process in which no water-soluble salts are employed. The amount of ionic residue in the finished product is negligible. It is especially recommended for use in critical electrical compounds.

No. 303 is identical except for a small amount of an inert mineral oil additive as a particle surface coating that reduces dusting.

Resins

These liquid adhesives are usable in many conventional resorcinol-glue applications and cost is lower. (164C)

Increased facilities for production of Synco 128 series resins have been put into operation by Snyder Chemical Corp. The resins are now available in carload and tank car quantities.

Though less expensive than conventional resorcinol glues, Snyder recommends them for many of the same applications: for hot and cold-press plywood, prefabricated housing, freight cars, truck bodies. Because they contain no water or other solvent, they have good gap-filling qualities and do not craze or shrink; sunken joints are eliminated.

Batches of glue-mix may be prepared in conventional glue mixers in a matter of minutes. The adhesives may be applied by mechanical roll spreader, glue-gun and glue-brush. The working life of the mixtures at normal temperature is 3 to 4 hr. Cure schedules are approximately the same as obtained with other room-temperature setting adhesives.

Synthetic Rubber Latex

First of the GR-S or general purpose varieties which promises to compete with natural rubber latex in large volume applications. (164D)

Cold synthetic rubber latex has been developed by a team of U. S. Rubber researchers for the RFC. Now, after two years in pilot-plant production, it will be made in government-owned plants and will become increasingly available to industry.

Seven varieties of cold rubber latex have already been developed. There is no one all-purpose type. As research progresses, many more will undoubtedly be possible. This means that synthetic latex can be tailor-made (Continued)



"Wonder-worker" for the wonder drugs

**How
Celite
filtration
assures purity,
speeds production**

When producers of antibiotics sought a filter aid that would assure removal of all mycelium and other gelatinous impurities in the broth from which wonder drugs are extracted—and speed their "put-through" in the bargain—Celite ended the search.

The effectiveness of Celite can be attributed to these important factors which make it unique among filter aids:

Carefully processed from the purest deposit of diatomaceous silica known, Celite is available in nine standard grades—each designed to trap out suspended impurities of a given size and type. Whenever you reorder, you are assured of the same uniform, accurately graded powder re-

ceived in your initial order. Thus, with Celite, you can count on consistent purity in your filtrates—at highest rate of flow—month after month, year after year.

The manufacture of wonder drugs is just one of the many processes in which consistent purity and faster filtration have been obtained through the use of Celite. Your own filtration problem, regardless of the product involved, can no doubt be solved with the proper grade of Johns-Manville filter aid. To have a Celite Filtration Engineer study your problem and offer recommendations, without cost or obligation, just write Johns-Manville, Box 290, New York 16, N. Y.

Celite is a registered Johns-Manville trade mark



Johns-Manville CELITE

FILTER AIDS



A ONE MAN "FIRE ENGINE"

—the Kidde Wheeled Dry Chemical Extinguisher

You can control a roaring fire in inflammable liquids, live electrical equipment, textiles or L-P gas. The Kidde 150 Pound Dry Chemical Wheeled Extinguisher packs a fire-fighting wallop that brings large fires under control quickly and easily.

The new "instant flow" hand control enables you to beat back fire with a long range "straight" stream...or to blanket the fire completely by the wider coverage of the improved "fan" pattern.

One man can wheel this extinguisher through a standard doorway...apply 150 pounds of fire-smothering dry chemical in less than one minute.

Write for full information on this new Kidde dry chemical extinguisher...or the full line of Kidde extinguishers and built-in systems.

Kidde

Walter Kidde & Company, Inc.

628 Main Street, Belleville 9, N. J.

Walter Kidde & Company of Canada, Ltd., Montreal, P. Q.

New Products, cont. . .

for specific applications. This versatility has not been possible with natural latex.

For example, one variety of cold latex can be used as 100 percent replacement for the natural product in the manufacture of foam sponge for cushioning. Still others show promise as replacements in the manufacture of tires containing rayon tire cord, in several dipping processes, in sheet packing materials and brake linings.

Pyrrolidine

Shows promise in making of surface active agents, drugs, rubber chemicals. (166A)

A highly reactive cyclic secondary amine, pyrrolidine has just become commercially available. Du Pont is offering 55-gal. drum lots at \$2 a lb., less than drum lots at \$3 a lb.

Pyrrolidine is obtained by reaction of tetrahydrofuran with ammonia at 400 deg. C. over an aluminum oxide catalyst. Its closest relative, structurally, is piperidine—still available in limited quantities only. Pyrrolidine boils at 86-87 deg. C., and is soluble in water and most organic solvents.

Suggested applications include: formation of rubber accelerators with carbon disulphide, similar to those obtained from piperidine; formation of N-alkyl pyrrolidines with alkyl halides which can be converted to quaternary bases of possible use as sterilizers and surfactants. A moderately strong organic base, pyrrolidine may be used as a solubilizer for acidic materials. It functions as a catalyst and reaction medium for certain organic reactions. With ethylene oxide, pyrrolidine gives an alkanolamine-N-hydroxyethyl pyrrolidine. And it is useful for introducing the pyrrolidyl ring, a physiologically active nucleus found in many natural products such as alkaloids.

Anti-Rust Paint

Applied right over rusted surfaces, it stops further action. (166B)

Suitable for both interior and exterior use, PCA-100 has been developed by Paint Corp. of America to prevent or stop rust action. On rusted surfaces, it is meant to be applied without such preparations as wire brushing, scraping or sand blasting. It penetrates the rust to the base metal and seals the surface against further damage. The paint is suitable for either brush or spray application.

PCA-100 is furnished in black only and, due to its penetrating character—
(Continued)



MASK ODORS WITH... *trimethyl cyclohexanol*

and expand your sales

Is an unpleasant odor in your product slowing down sales? Try masking it with Trimethyl Cyclohexanol. This material has a refreshing menthol-like odor that effectively masks many unpleasant odors. It is particularly effective in masking "sulfur" odors of lubricating oils. The volatility of Trimethyl Cyclohexanol is low, so its masking effect is long-lasting. Trimethyl Cyclohexanol is a cyclic alcohol, exhibiting cis-trans isomerism, and is supplied in both the high-melting and low-melting forms.

As an Intermediate—Metallic derivatives are useful as gasoline and lube oil additives. Investigate its esters as special-purpose plasticizers.

Judge this chemical for yourself. Call or write the nearest CARBIDE office for a sample of Trimethyl Cyclohexanol. Put it through your own tests and determine its usefulness to you. Additional technical assistance is available when you need it.

other Higher Alcohols

Trimethyl Cyclohexanol is only one of several higher alcohols produced by CARBIDE. Trimethyl nonyl alcohol and 2-butyl octanol, both 12-carbon alcohols, should be of interest to you as intermediates for rubber chemicals, lubricant additives, and surface-active agents. All three of these higher alcohols are available now in commercial quantities.

Physical Properties

	Low-Melting Isomer	High-Melting Isomer
Specific Gravity	0.8778 at 40/20°C.	0.8643 at 60/20°C.
Boiling Point, 760 mm. Hg	197.6°C.	189.2°C.
Vapor Pressure	0.1 mm. Hg at 40°C.	0.5 mm. Hg at 20°C.
Freezing Point	37°C.	55.8°C.
Absolute Viscosity	16.11 cps. at 40°C.	5.4 cps. at 60°C.
Solubility in Water at 20°C.	0.17% by wt.	0.11% by wt.

CARBIDE AND CARBON CHEMICALS COMPANY

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Pangborn DUST CONTROL

Turns Dust Into Profits!

At Flory Foundry, this small and inexpensive Pangborn Dust Collector stops dust caused by blast cleaning operations... pays its own way in increased efficiency.

At Dodge Cork Company, a Pangborn Dust Control System salvages \$5000.00 worth of cork dust every year from some 40 sawing and polishing machines.

At Landers, Frary & Clark, a Pangborn Dust Collector like this traps 522 cu. ft. of cast iron dust per day... company records prove maintenance costs are lower than ever before.

Dust is no problem for plants with Pangborn Dust Control. As these three cases (picked from hundreds in our files) show, a Pangborn Dust Control System *saves money* on maintenance when dust is a nuisance, *saves money* when dust has salvage value.

FIND OUT TODAY

how you can *save money* with Pangborn Dust Control. Write for your copy of Bulletin 909-A to: PANGBORN CORPORATION, 2600 Pangborn Blvd., Hagerstown, Md.

Look to Pangborn for the latest developments in Dust Control and Blast Cleaning equipment.

Pangborn

DUST CONTROL

STOPS THE DUST HOG from stealing profits



NEW PRODUCTS, cont. . .

istics, should be used solely as a finish coat. It is available in 1 and 5-gal. cans and in 55-gal. drums.

Coating for Magnesium

Electrolytically applied corrosion resistance which can be applied to any commercial magnesium alloy. 168A

We've told you (June, p. 164) about the excellent corrosion, heat and abrasion resistance of Army Ordnance's new HAE coating for any of the commercial magnesium alloys. Here's the proof of what it can do. Magnesium alloy test panels, below, strikingly show HAE's superiority over bichromate and proprietary anodic treatment under various corrosive conditions. Abrasion tests were conducted with abrasion wheel CS-17 (Tabor Abrasor). In testing for heat resistance, HAE-coated panel was subjected to two Fisher blast burners; the magnesium melted locally and formed a bulge without cracking.

Test Results . . .

SALT SPRAY RESISTANCE

Galvanic corrosion after 5-hr. exposure to salt spray.

HAE Treated

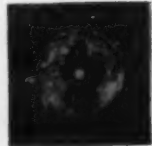
Bichromate Treated



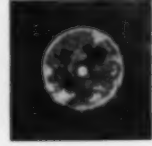
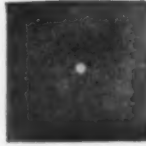
Aluminum Disks



Zinc Disks

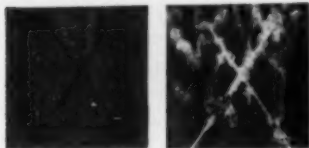


Steel Disks



Copper Disks

Panels painted with one coat of olive drab enamel, after 4,800-hr. exposure to salt spray.



After 120-hr. exposure to salt spray.

HAE Treated

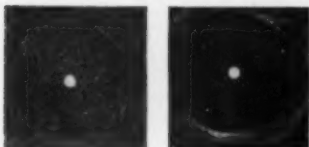
Anodized



ABRASION RESISTANCE

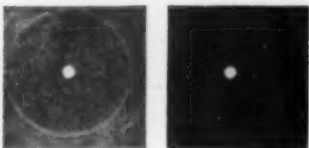
HAE Treated

Bichromate Treated



5,000 cy.
no breakdown

20 cy.
breakdown-2 cy.



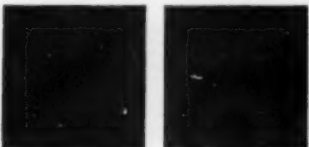
5,000 cy.
no breakdown

75 cy.
breakdown-5 cy.

HEAT RESISTANCE

Before

After



Gasket Material

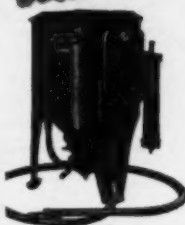
Asbestos-neoprene formulation to resist oil, water, gasoline. (169A)

Rogers Corp., Manchester, Conn., developed Duroid 3102 for gasket use then tested for the requisite properties. They found: water absorption rate of 15 percent in 24 hr.; good gasoline and oil resistance and flexibility; a bursting strength of 500 psi.

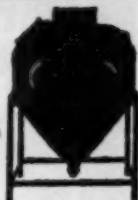
Recommended for use at temperatures under 300 deg. F., Duroid 3102 is supplied in thicknesses ranging from 0.031 in. to 0.125 in. —End

Here's how Pangborn Solves these Problems with this modern equipment

BLAST CLEANING!



Blast Cleaning Cabinet quickly and easily cleans rust, grime, dirt, paint, etc., from metal parts. Produces a clean, smooth surface on pieces up to 60" x 36". Models available from \$315.00 and up.



Blast Cleaning Machine not only removes rust, dirt, scale, etc., but is ideal for maintenance and many other uses. Cleans large objects such as bridges, structural work, tanks before painting. Six sizes, portable or stationary, from \$170.00 and up.



DUST COLLECTING!

Unit Dust Collector stops dust at its source, minimizes machine wear and tear, reduces housekeeping and general maintenance costs. Solves many grinding and polishing nuisances. Reduces material losses. Models from \$286.00 and up.



PRECISION FINISHING!

Hydro-Finish Cabinet uses liquid blast, eliminating dust, and reduces costly hand polishing, cleaning and finishing of molds, dies, tools, etc. Removes scale, discoloration and directional grinding lines, prepares surfaces for plating and coating. Holds tolerances to .0001". Models from \$1295.00 and up.

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FOR THE LATEST DEVELOPMENTS IN BLAST
CLEANING AND DUST
CONTROL EQUIPMENT

Pangborn

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- ☐ Unit Dust Collectors
- ☐ Hydro-Finish Cabinets

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City.....Zone.....State.....

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Liquid

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Company

Address

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CE's Guide to

NEW TECHNICAL LITERATURE

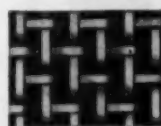
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Defense 180B	. . . prepare your plant for atomic attack. Latest factual information about the atomic bomb, its destructive potential, its limitations; guide to plant management in organizing personnel to cope with possible plant disasters; recommendations for strengthening plant construction and sustaining production in the face of bomb attack. Illustrated. 32 pages.	Walter Kidd & Co.
Instruments 170C	. . . select the proper meters for over 200 chemicals, petroleum products, and other liquids with varying corrosive characteristics. Table of meter-liquid matched with case, chamber and piston specifications of the required meter. 12 pages.	Rockwell Mfg. Co.
Standards 170D	. . . simplify production, reduce costs and gain other benefits by standardizing products within an industry through the facilities of the ASA. Cartoons and text effectively and amusingly present a strong argument with "The Strange Case of the Seven-Sided Post Hole." 44 pages.	American Standards Assn.
Conveyor Belts 170E	. . . obtain the equipment to construct the correct type of belt and conveyor for your particular application. Illustrations of standard and special types of wire belting, weaves with specifications and detailed descriptions. Power formulas and construction details, suggestions for prolonging belt life and increasing efficiency. 33 pages.	Korb-Pettit Wire Fabrics and Iron Works, Inc.
Valves 170F	. . . pick the right small size, cast carbon steel gate valve for applications in general high pressure service in refineries and other industrial installations. Labeled sectional views, dimensions, materials and list prices for 600 lb. O.S.&Y., bolted bonnet, 1/4-2 in.; O.S.&Y., union bonnet, 1/4-2 in.; inside screw, union bonnet, 1/4-2 in. 12 pages.	Pacific Valves, Inc.
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Instruments 170I	. . . apply and operate this company's GAP/R high speed all-electronic analog computers for research and design. Manual covers origin, development, component philosophy, operating procedures, oscilloscope presentation techniques, choice of scale factors. Multiple types of components and principles of their operation are catalogued. 34 pages.	George A. Philbrick Researches, Inc.
Roll Mills 170J	. . . correctly apply roll mills for both wet and dry grinding. Methods of construction and design features of conical, flanged-end and conical-head mills, both trunnion overflow and peripheral discharge types. Specifications include sizes, weights, roll charges, speeds, types of liners, etc. 12 pages.	Hardinge Co.
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Steam Traps 170P	. . . trap double the drainage capacity of ordinary thermostatic traps with a single unit combining a steam trap, air-by-pass, check valve, strainer, sight glass, temperature indicator and control. Cutaway views show construction, operation. Typical installation, performance, illustrated and described. 16 pages.	Velan Engineering Co.

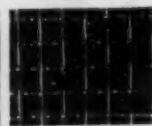
What's New In . . .	How To . . .	Company . . .
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Conveyors 171F	. . . install, operate and maintain chain drives and conveyors. Photographs show the line; graphs and diagrams illustrate details. 36 pages.	Chain Pelt Co. of Milwaukee
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Wire Cloth 171I	. . . choose wire cloth or equipment incorporating wire cloth. Seven bulletins featuring: metallic filter cloth; comparative ultimate strengths of conveyor belts; spiral woven wire belting; installation photos showing the right belting for the various applications; woven wire cloth, wire screens, filter cloth for special applications; conveyor belts woven of stainless, Inconel, Nichrome, brass, bronze, etc. for application in chemical, rubber, textiles, foods, materials handling, etc.; food processing equipment. 4 pages each. Another bulletin covers woven wire conveyor belts for high temperature service. 8 pages.	Cambridge Wire Cloth Co.
Patents 171J	. . . see the basic facts of why our patent system plays such an important part in our economy—"Patent Background for Engineers." A collection of articles written by specialists. 72 pages.	Allis-Chalmers Mfg. Co.
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Rubber 171P	. . . decide whether you have a use for a closed cellular rubber. Properties chart, typical applications. Picture sequence shows principal steps in manufacture. Sample card included with bulletin on request.	Great American Industries, Inc.
Motors 171Q	. . . keep your motors up to par by applying to one of this company's 200 product service stations featured here on a map of the U. S. 4 pages.	A. O. Smith Cor.
Insecticides 171R	. . . use DDT dusts or sprays to control insects. Describes several types of DDT formulations, including dusts, wettable powders, emulsions, solutions and aerosols and discusses the best uses for each. 20 pages.	Monsanto Chemical Co.
Coatings 171S	. . . obtain a grade I finish on steel in compliance with Government Specification JAN-c-490. Method of application, heat requirements, chemical required for bath make-up, cost data on this company's zinc phosphate coating. 4 pages.	American Chemical Paint Co.
Motors 171T	. . . choose a single-phase, polyphase or squirrel-cage motor for your product or plant. Representative models of each type are pictured and described with suggested applications. 4 pages.	Wagner Electric Corp.

(Continued)

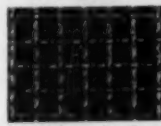
9 REASONS for specifying Cambridge Industrial Wire Cloth



1. Flat Wire Mesh



2. Single Intermediate Crimp



3. Double Intermediate Crimp



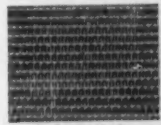
4. Double Crimped



5. Twilled Weave



6. Colored Backing Screen



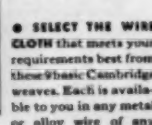
7. Oblong Mesh



8. Plain Dutch Filter Cloth



9. Twilled Dutch Filter Cloth



10. Twilled Dutch Filter Cloth

● SELECT THE WIRE CLOTH that meets your requirements best from these 9 basic Cambridge weaves. Each is available to you in any metal or alloy wire of any gauge. Mesh sizes range from 4" openings to 20 x 250 mesh, according to your needs. Many types of Cambridge wire cloth are ready for immediate shipment.

Close attention to each loom by individual operators during weaving is your assurance of exact mesh count. Each finished piece is carefully inspected before shipment to make certain it is free from defects.

TELL US your special problem in filtration, screening or sizing. Perhaps our facilities and experience can be combined to produce the special type of wire cloth needed.

FREE WIRE CLOTH HANDBOOK! 73 pages of specifications, metallurgical data and descriptions of industrial wire cloth. WRITE TODAY for your copy of this valuable reference book.



The Cambridge Wire Cloth Co.
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Manufacturers of automatic Pressure, Temperature,
Level and Flow Controls

FACTORY BRANCHES: Baltimore 5, Birmingham 3, Boston 16, Buffalo 3, Chicago 5, Cincinnati 2, Cleveland 15, Dallas 2, Denver 4, Detroit 21, Glendale 1, Houston 6, Indianapolis 4, Kansas City 2, Minneapolis 2, Newark 6, New York 17, Philadelphia 23, Pittsburgh 22, St. Louis 3, San Francisco 7, Seattle 1, Tulsa 6, Washington 6.
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SURE
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NO GUESSWORK IN YOUR DRYER APPLICATION

Test drying in our "pilot" plant is a good example of the engineering thoroughness and progressiveness you may expect from Standard. Test dryer may be adjusted to duplicate performance of any type rotary dryer. You learn in advance the exact requirements for your final dryer application. For full information on "pilot" drying and the more than 30 types of Standard-Hersey Dryers available for the process industries, write today for DRYER BULLETIN 508.



STANDARD STEEL CORPORATION

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NEW TECHNICAL LITERATURE, CONT. . .

What's New In . . .

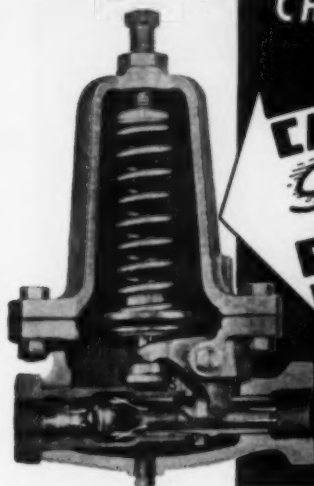
How To . . .

Company . . .

Equipment 172A	. . . fight the effects of corrosion, heat or abrasion by choosing from a line of stainless and high alloy equipment for the pulp and paper, chemical, food processing, petroleum industries. Breakdown of the types of corrosion problems coupled, with properties of suitably resistant alloys. Detailed specification charts for fittings, flanges, valves, pipe and tubing. Weight, area, hardness and standard conversion tables. 65 pages.	Electric Steel Foundry, Co.
Pipe 172B	. . . guard pipe and fume ducts against acid and alkali by having them made of a furan resin reinforced with chemical glass fabric. Properties of the material. Dimensions of the pipe, ducts, connections, fittings. 8 pages.	Maurice A. Knight Co.
Filters 172C	. . . install, where to use, same mud filters. Method and cost of operation, construction details, sizes, capacities. Installation photographs; flow diagram of typical layout. 16 pages.	Oliver United Filters Inc.
Instruments 172D	. . . electronically record and control humidities for industrial air conditioning. Photographs of inner and outer workings of the controller; general specifications; blueprints of typical systems. 4 pages. Another bulletin covers a device suitable for connection to any pneumatic receiver-indicator, recorder or controller to provide clearer liquid level control than obtainable by conventional ball float buoyancy type controllers. Range materials, connections, dimensions. 4 pages. A third bulletin covers an X-ray spectrometer which features a wide range Geiger-counter goniometer and an electronic recorder. Application theory of operation; illustrations of the instrument and of analytical results obtained. 4 pages.	Minneapolis-Honeywell Regulator Co.
Aluminum 172E	. . . operate an aluminum company—details on Reynolds production facilities, products, fields served. Production of aluminum from bauxite, characterization of the metal, its various product forms and their applications. Over 250 illustrations. Special insert shows a few military applications. 48 pages.	Reynolds Metals Co.
Instruments 172F	. . . measure non-destructively, and from one side only, the wall thickness of pressure vessels or piping with the Penetron which uses the penetrating power of primary or secondary gamma radiations. Specifications, construction photographs. 4 pages. Another bulletin covers the Leveltron, a device for measuring and controlling liquid level. Utilizing gamma radiations, it will solve many problems where the conventional float or gage is impractical. 8 pages.	United Engineers Inc.
Nitrogen 172G	. . . produce pure nitrogen inexpensively with a controllable hydrogen content. Operation, applications, cost, schematic flow diagram of generator. 2 pages.	Minneapolis-Honeywell Regulator Co.
Spring Hangers 172H	. . . support piping and allied equipment subject to positional changes resulting from thermal expansion of equipment to be supported. Sectional views of various models keyed to dimension tables. 16 pages.	Bergon Genspring Corp.
Instruments 172I	. . . obtain optical and illuminating equipment for inspection jobs from simple naked-eye illuminated inspection to high-power, close-tolerance microscopic examinations; black-light; fluorescent and around-the-corner inspection of the inaccessible or the out of view. Pictures, dimensions, prices of equipment. 8 pages.	Arthur S. LaVine & Co.
Precision Balls 172J	. . . satisfy special requirements for high-precision balls of any desired material, size and surface finish. Shows typical tolerances, lists minimum quantities on special orders, gives typical uses of the company's carbide balls. 2 pages.	Industrial Tectonics, Inc.
Instruments 172K	. . . choose and use an electronic strip chart pneumatic control potentiometer. 2 pages.	Minneapolis-Honeywell Regulator Co.
Instruments 172L	. . . detect the location of statically charged areas with an electrostatic voltmeter. Hand-held unit contains its own power in the form of batteries.	Tri-Clover Machine Co.
Traps 172M	. . . select the right stainless steel magnetic trap for the dairy, food, bottling or chemical industries. Diagrammed and pictured. 2 pages.	Specialties, Inc.
Mixers 172N	. . . operate and where to use a new high-speed centrifugal machine known as the Entoleter mixer. Photographs show it has solved specific mixing problems. 4 pages.	Safety Car Heating and Lighting Co.
Instruments 172P	. . . solve a variety of problems with all-electronic analog computers which utilize dynamic block diagrams. Here is a catalog and manual which explains the properties and methods of using the separate operational components which make up the classes of problems handled by these computers. 35 pages.	Geo. A. Philbrick Researches, Inc.
Synthetic Crystals 172Q	. . . find synthetic single-crystal products for use where extreme hardness, low friction, high dielectric strength and resistance to wear, heat and corrosion are required. Tables give properties and available forms of sapphire, epoxies, titanium, calcium tungstate, cadmium tungstate and fine alumina polishing powders. 4 pages.	Linde Air Products Co.

—End

Available in sizes $\frac{1}{4}$ " to 2"
Each size with expanded outlet
if desired.



• Flow has been streamlined for
straight flow into the delivery pas-
sage and jet. See FIG. 1. The fluid

FIG. 1



flows smoothly around this valve with
no back eddies to cause turbulence.
See FIG. 2, on the downstream side
of its trailing edge. In a reducing
valve all the pressure drop or work
of pressure reduction should occur at
one place, namely where the valve
throttles flow, and not on the down-
stream side of the valve. Where you
have downstream turbulence, see
FIG. 2, the greatest amount of tur-
bulence with resultant greatest pres-
sure drop will occur when you want
maximum flow and therefore want
least pressure drop—if the delivery
pressure is to be maintained. With

FIG. 2



Streamlined Flow. See FIG. 1, you
get maximum capacity, plus close
delivery pressure control.

EVEN WITH SUPPLY
LINE AND DEMAND
CHANGES

CASH STANDARD
Streamlined
PRESSURE
REDUCING VALVE
TYPE 1000

YOU HAVE SMOOTH
ACTION AND CLOSE
Dependable
REGULATION

★ The "1000" Valve, streamlined for smooth, even
flow of steam, water, air, oil, etc., reduces a higher
pressure to a lower pressure. In this operation it
holds the lower pressure constant regardless of
variation in the initial pressure or variations in de-
mand. The net results are no spoilage due to
erratic pressure, and savings in operating and
maintenance costs.

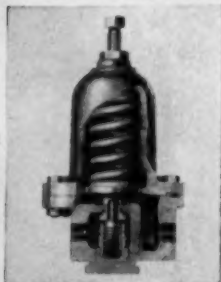
What Streamlined Flow Gives You in Benefits

1. Maximum Capacity when needed most
2. Accurate Pressure Control under toughest working conditions
3. Trouble-free Service
4. Smooth Operation
5. Tight Closure
6. Accurate Regulation
7. Speedier Production Results
8. Elimination of failures
9. Constant Delivery Pressure
10. Cost Saving Operation
11. No Spoilage
12. Practically zero in maintenance costs

WRITE FOR BULLETIN 1000

Get details on the performance of this "Streamlined"
1000 Valve that insures maximum capacity—close de-
livery pressure control, and saves operating and
maintenance costs.

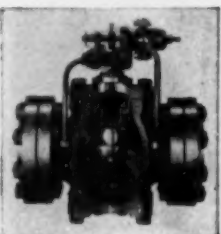
OTHER VALVES
from the
CASH STANDARD
LINE



High Pressure Reducing Valve
Type H-P; extra heavy for use
with initial pressures up to 5000
lbs.; and for reduced pressures
up to 450 lbs. Good for most
fluids. Sizes: $\frac{1}{2}$ " to 2"; bronze
body; nitralloy trim. Get Bulle-
tin 931.



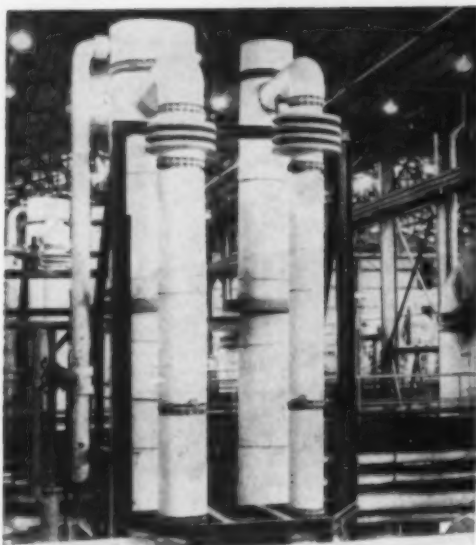
Type 8871 Pressure Regulator for
dirty liquids (like Sinker C fuel
oil). Inner valve is bolted to dia-
phragm for positive movement.
Sizes: $\frac{1}{2}$ " to 10". Bodies: iron,
bronze, or steel. Seat ring and
inner valve: stainless steel. Bulle-
tin 972.



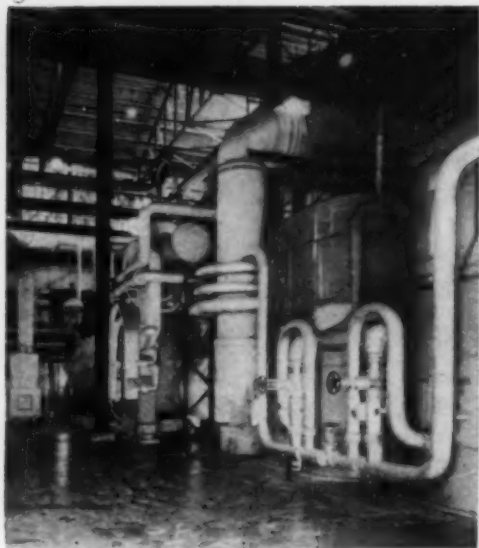
Cash Standard Type 10 Pressure
Regulating Valve, pilot operated.
(Pilot operating fluid discharges
to outlet pipe; not wasted). Sizes:
2" to 12". Highest pressures:
inlet 600 lbs.; reduced 250 lbs.
iron, bronze, or steel bodies;
standard trims. For water, air,
non-corrosive gases and oils. Get
interesting Bulletin 966.

CASH STANDARD
CONTROLS..
VALVES

A. W. CASH COMPANY
DECATUR, ILLINOIS



1 Heat exchangers use heat of reaction gas to preheat natural gas and steam entering primary reformer furnace.



2 Vessels containing zinc oxide pellets remove organic sulphur that may be present from incoming gas.

Anhydrous Ammonia

Production of anhydrous ammonia is a vital part of our mobilization effort. Output of this important industrial chemical has been growing steadily. More than 147,000 tons are being made in this country each month. Here is the way one major producer supplies more than 11 percent of our nation's needs.

Anhydrous ammonia is produced by Lion Oil Co. at El Dorado, Ark. The plant was Designed by Chemical Construction Corp. to produce ammonia from natural gas by a modification of the Haber-Bosch process. Production capacity of the plant is 570 tons of ammonia per day, approximately one-fourth of which is sold as such. The other part is used in Lion's plant for the production of ammonium sulphate, nitric acid as well as ammonium nitrate.

Three principal steps in production of ammonia are (1) gas reforming, (2) purification and (3) synthesis. The gas reform step prepares the process gas from which anhydrous ammonia is made. This gas coming out of the reform step contains the required one-to-three ratio of nitrogen and hydrogen. In addition it has impurities such as carbon dioxide and carbon monoxide.

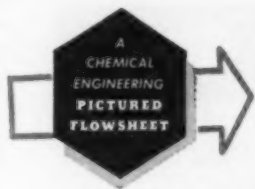
In purification the CO_2 and CO are removed in two principal operations each of which has definite heat and

pressure requirements. The gas from reform is first compressed to 220 psi. for removal of the carbon dioxide. This is accomplished by scrubbing the gas either with water in a water scrubbing tower or with MEA solution (monoethanolamine) in a Girbotol unit. Both systems are in use.

Next the gas is compressed to 1,800 psi. for removal of carbon monoxide and any remaining carbon dioxide by scrubbing with copper liquor (copper-ammonium-formate) and caustic.

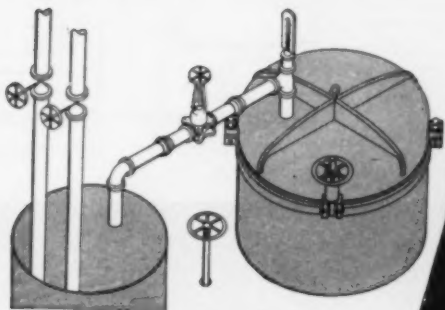
The purified gas is then compressed to approximately 5,000 psi. This pressure is required for the final synthesis step in which the hydrogen and nitrogen are made to unite to form finished ammonia. This is accomplished at approximately 525 deg. C. and about 5,000 psi. in the presence of a catalyst. Not all the gas is reacted on its first pass through the catalyst bed. It must be recirculated through a synthesis loop system from which liquid ammonia is constantly withdrawn and the amount reacted is constantly replaced in the loop by new process gas.

Finished ammonia is then piped to the storage section to be placed in storage spheres, or loaded directly into tank cars for shipment, or transferred to other sections of the plant for further processing.



for outstanding service like this

**Rely on
Dependable
CRANE VALVES**



The Installation—Phoenix Dye Works, Chicago, Ill.

PROBLEM: To find a durable replacement valve for dye line on package dye machine. Various cocks and valves tried, lasting only a maximum of 1 to 2 months, with much leakage, sticking, and maintenance.

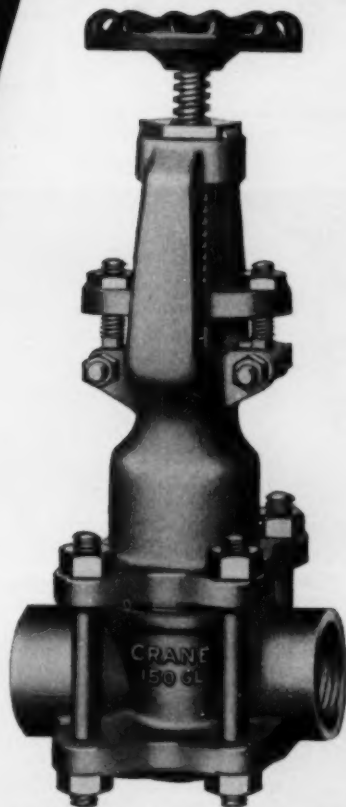
WORKING CONDITIONS: Valve almost constantly in contact with varying acid dye solutions, at temperatures ranging from 50 to 210 degrees F. Operated about 100 times daily, often with disc in throttling position.

SOLUTION: Crane No. 18850, all 18-8 Mo Stainless Steel Plug Gate Valve.

RESULT: User reports: after more than 3 years' uninterrupted service, no leakage through valve... no sign of corrosion... no maintenance expense... unusually easy operation. Enthusiastic about performance of Crane Plug Gate Valves.

...Another typical example of the long life and low-cost upkeep that Crane Quality Valves are famous for. And that's why...

More CRANE VALVES are used than any other make!



**No. 18850 Crane 18-8 Mo Plug Gate Valve
for throttling or full-flow service. (No. 17750 in Monel.)
Send for new folder AD-1855.**

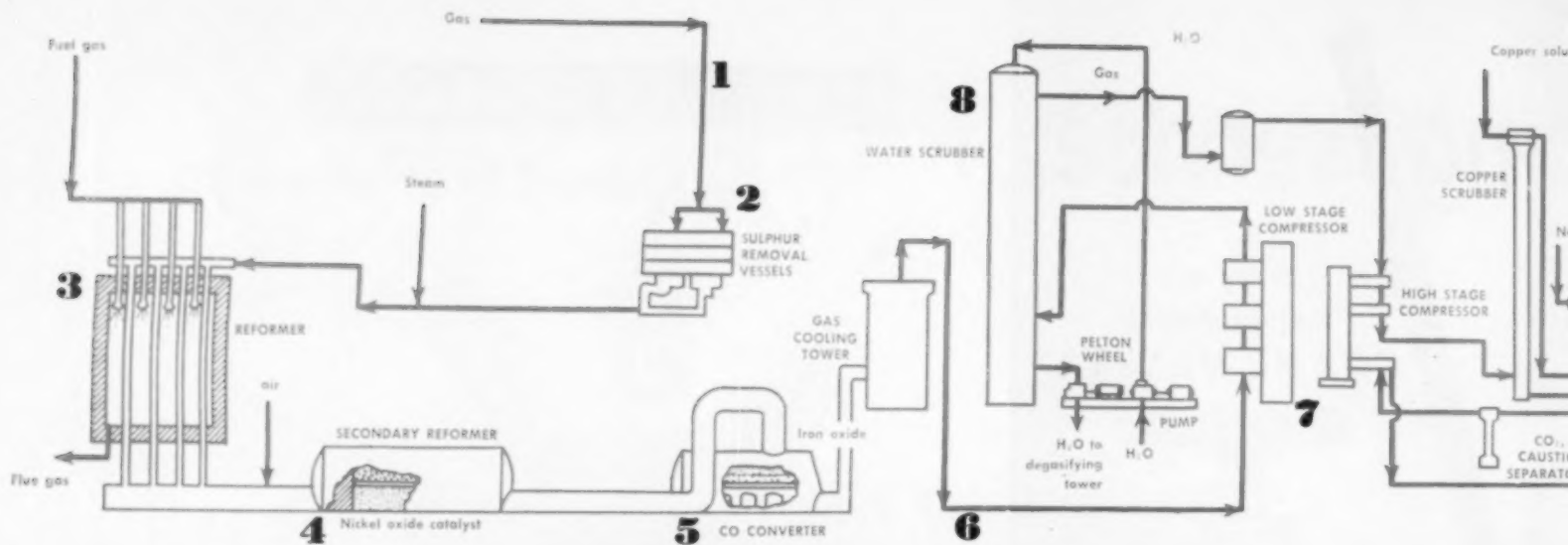
CRANE CO.

General Offices:
836 S. Michigan Ave., Chicago 5, Ill.
Branches and Wholesalers Serving
All Industrial Areas

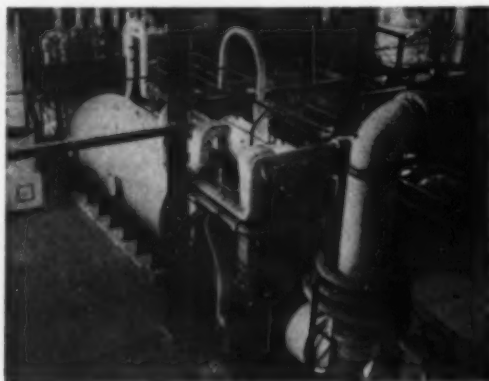
VALVES • FITTINGS • PIPE • PLUMBING • HEATING

CHEMICAL ENGINEERING—August 1951

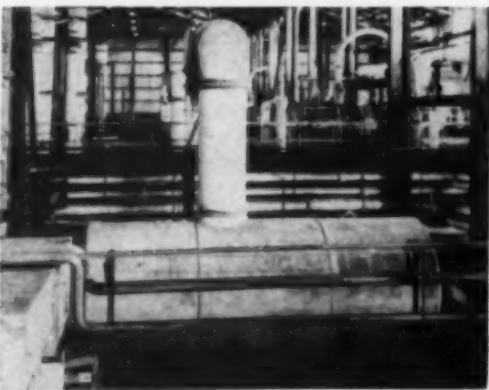
179



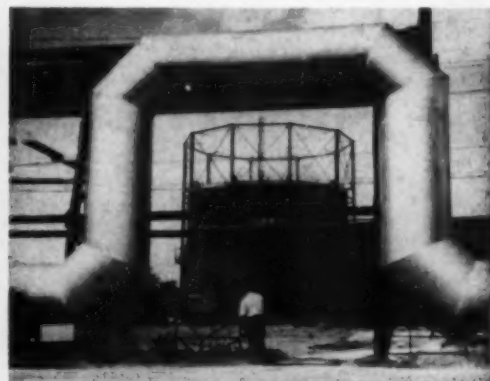
3 Primary reformer furnaces react natural gas and steam to produce hydrogen, carbon monoxide and carbon dioxide.



4 Secondary reformer, horizontal vessel at left, gives additional reforming. Air is added to produce nitrogen.



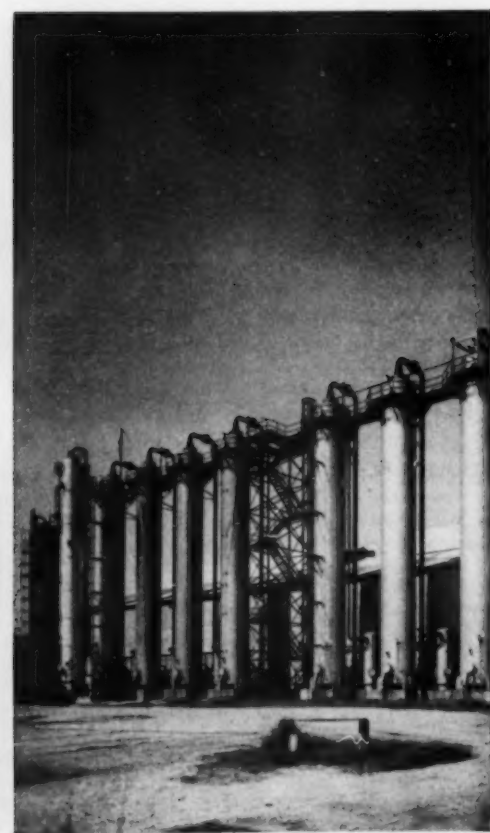
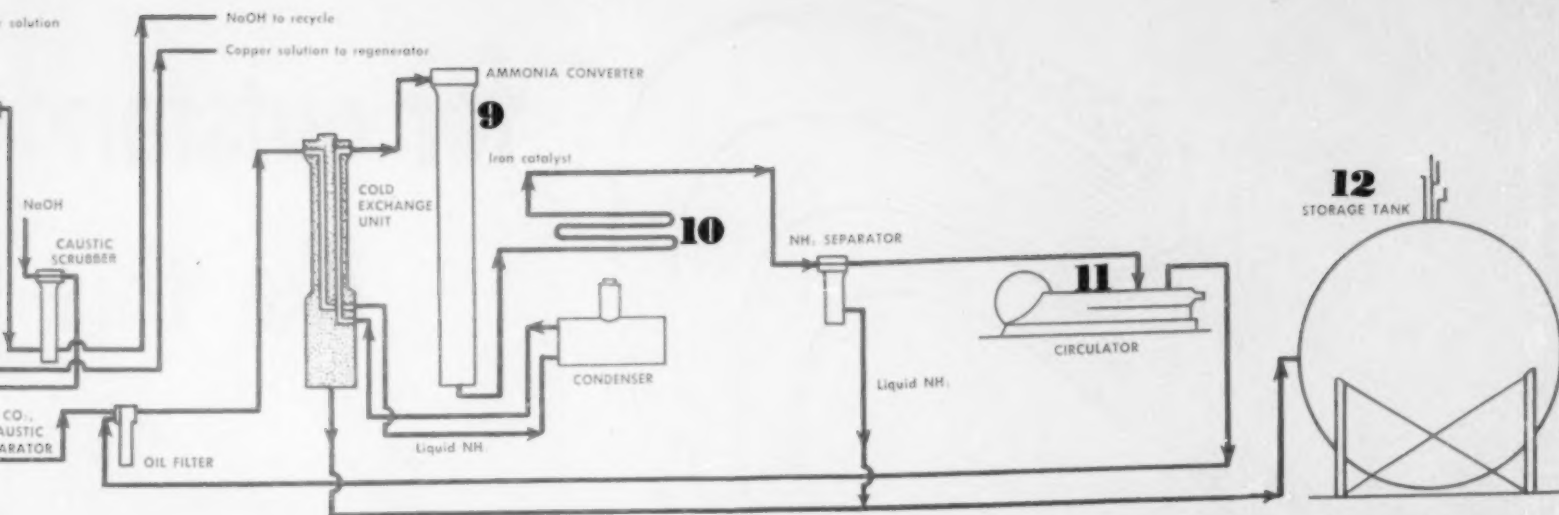
5 Converter with iron oxide catalyst is where CO is reacted with steam to produce hydrogen and CO₂.



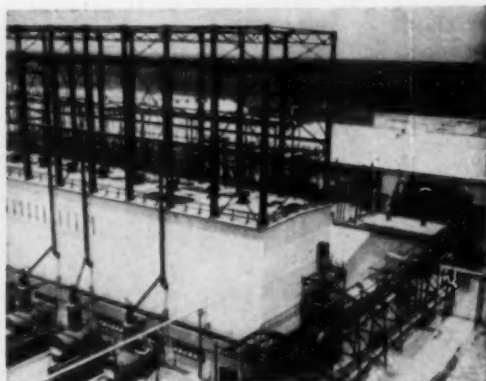
6 Pipeline, 54-in. dia., is used for conveying reaction gas from gas reform unit to compressor building.



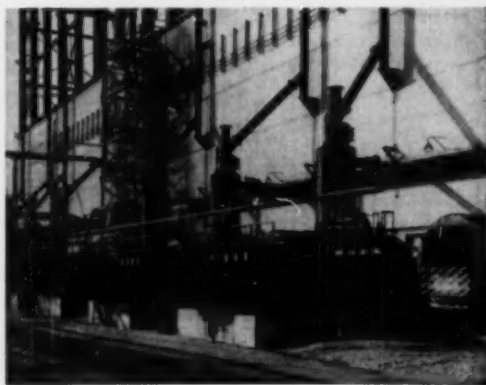
7 Compressors supply pressure required for purification and synthesis takes six steps of compression.



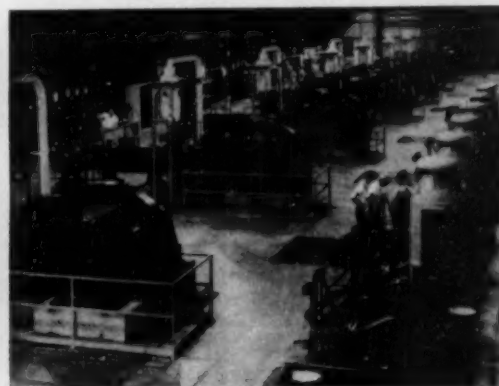
8 Scrubbing towers remove CO_2 . Eight on right use water and two on left (Girbotol unit) use MEA solution.



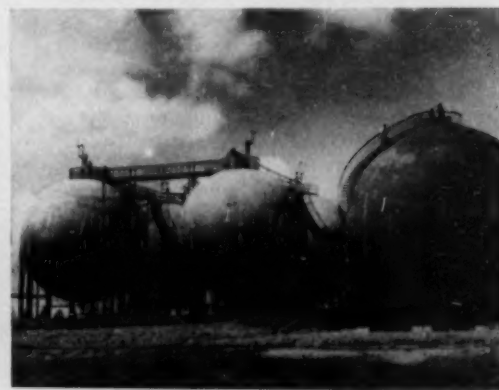
9 Synthesis building houses high-pressure converters. Here hydrogen and nitrogen unite to make ammonia.



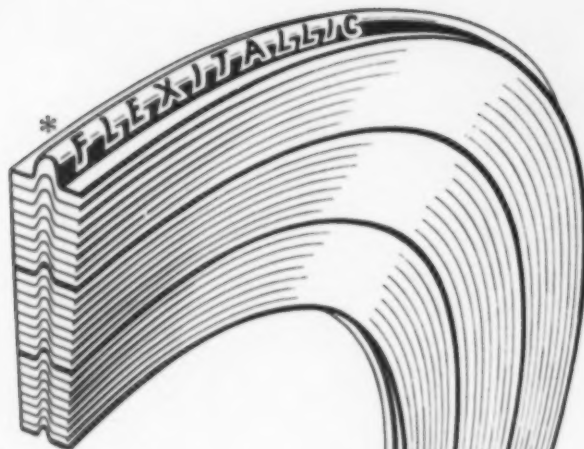
10 Condensers for condensing anhydrous ammonia formed in converters. Some are ammonia cooled, others use water.



11 Circulators in synthesis building remove process gas through synthesis loop and maintain pressure.



12 Spheres are used for storage of anhydrous ammonia. Smaller spheres hold 500 tons, others hold 1,300 tons.



It started with a V-crimp in Gaskets

In the new high-pressure, high-temperature power and processing plants, it is the spring-action of Flexitallic Spiral-Wound Gaskets that makes flanged joints effective. Prevents seepage caused by line strains, thermal shocks or vibration. Simplifies breaking and reassembly of joints. With pressures from vacuum to 2500 lbs. and with temperatures from -200° F. to 1800° F., the V-crimp construction of the Flexitallic Gasket results in a highly resilient seal and a low seating stress on the bolting. Properties of metal, type of filler, relationship of metal to filler—all these are variables in the design of a

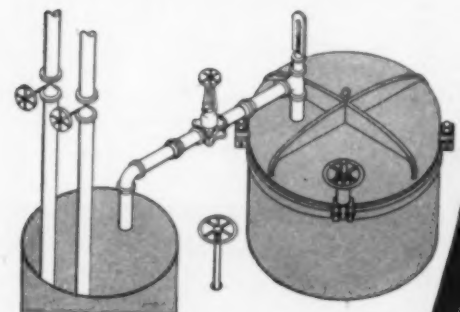
Flexitallic Gasket. Made for all standard joint assemblies in four thicknesses .125", .175", .250" and .285". Also available for special joint assemblies up to 104" diameter... Flexitallic Gasket Company, Eighth and Bailey Streets, Camden 2, New Jersey.

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*Look for the name FLEXITALLIC stamped into the metal spiral of every genuine Flexitallic Gasket—look for Flexitallic Blue in gaskets with asbestos filler.

REPRESENTATIVES in principal cities: *Indianapolis—Industriale Engineering Co., Inc.; *AMARILLO—Moorhead Co.; *ATLANTA—Boiler Equipment Service Co.; *BALTIMORE—Tob Engineering & Supply Co., Inc.; *BOSTON—G. H. Thomson; *BUFFALO—Lazo Engineering Co.; *CHICAGO—A. L. Crane & Co.; *CINCINNATI—A. Gerlach; *CLEVELAND—Hill Power Control Co.; *DENVER—Moorhead Co.; *DES MOINES—Carl Grimm & Co.; *DETROIT—Meyl Co.; *HOUSTON—C. Corbett Co.; *Gulf Engineering Co.; *JACKSONVILLE—Moorhead Co.; *KANSAS CITY—Moorhead Co.; *LOS ANGELES—Power Engineering & Equipment Co., Inc.; *MILWAUKEE—N. Dietz; *MINNEAPOLIS—Plant Equipment, Inc.; *MOBILE—Marine Specialty Co.; *NEW ORLEANS—H. H. Ashburn & Phipps; *NEW YORK—Consolidated Packing & Supply Co.; *NORFOLK—Empire Machinery & Supply Corp.; *OKLAHOMA CITY—Moorhead Co.; *PHILADELPHIA—Energy Control Corp.; *PITTSBURGH—T. J. Barry; *PORTLAND—W. J. Robbins; *ST. LOUIS—Lazo Machinery Co., Inc.; *SAN FRANCISCO—Corde Brothers; *Savannah—Southern Marine Supply Co., Inc.; *SEATTLE—International Sales Corp.; *SINGAPORE—Meyl Co.; *TYLER—Moorhead Co.; *WICHITA—Moorhead Co.; *WILMINGTON, DEL.—Energy Control Corp.; *IN OTHER COUNTRIES—*MONTREAL—Industriale Engineering & Service Co., Ltd.; *VANCOUVER—Flex Seal, Ltd.; *HONOLULU—American Factors, Ltd.; *MEXICO CITY—Consultores y Abastecedores, S.A.; *SAN JUAN—F. B. Luch Co.; *ROTTERDAM—Van der Mark & Co.

for outstanding like this



The Installation—Phoenix Dye Works, Chicago, Ill.

PROBLEM: To find a durable replacement valve for dye line on package dye machine. Various cocks and valves tried, lasting only a maximum of 1 to 2 months, with much leakage, sticking, and maintenance.

WORKING CONDITIONS: Valve almost constantly in contact with varying acid dye solutions, at temperatures ranging from 50 to 210 degrees F. Operated about 100 times daily, often with disc in throttling position.

SOLUTION: Crane No. 18850, all 18-8 Mo Stainless Steel Plug Gate Valve.

RESULT: User reports: after more than 3 years' uninterrupted service, no leakage through valve... no sign of corrosion... no maintenance expense... unusually easy operation. Enthusiastic about performance of Crane Plug Gate Valves.

...Another typical example of the long life and low-cost upkeep that Crane Quality Valves are famous for. And that's why...

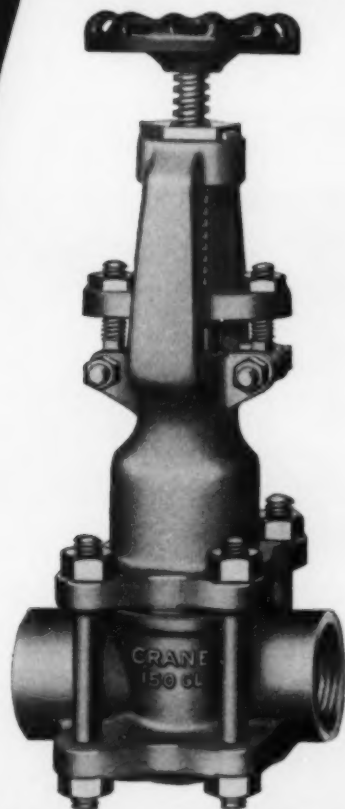
More CRANE VALVES are used than any other make!

CRANE CO

VALVES • FITTINGS • PIPE

ing/service

**Rely on
Dependable
CRANE VALVES**



No. 18850 Crane 18-8 Mo Plug Gate Valve
for throttling or full-flow service. (No. 17750 in Monel.)
Send for new folder AD-1855.

General Offices:
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Branches and Wholesalers Serving
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CO.
PLUMBING • HEATING



RAYMOND Roller Mills perform outstanding jobs in many cases where unusual materials must be ground to high finenesses. Hard to pulverize materials such as burned lime and phenol resins; sticky materials as titanium and iron oxides; and inflammable materials such as sulphur are handled as standard operations with this unit.

These, and hundreds of other materials, are pulverized, classified, and conveyed in an entirely automatic, dustless system. Practically any desired fineness from about all passing 20 mesh to 99% or better passing 325 mesh is available merely by one simple adjustment.

Flash Drying results in double economies in many operations, since products can be ground and dried simultaneously.

If you have an operation involving a softer material difficult to pulverize by ordinary means, let Raymond engineers study it without obligation. Tell us about your problem in detail.



Raymond Roller Mills are built in several sizes and types for varied requirements

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CATALOG
NO. 61

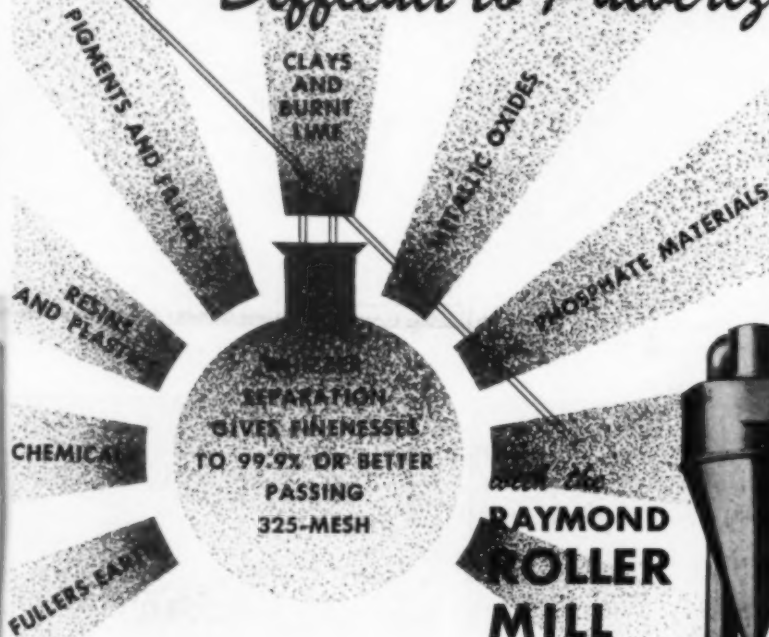
COMBUSTION ENGINEERING-SUPERHEATER, INC.

Raymond
PULVERIZER DIVISION

Sales Offices in Principal Cities

1311 North Branch St.
Chicago 22, Ill.

Difficult to Pulverize



RAYMOND Roller Mills perform outstanding jobs in many cases where unusual materials must be ground to high finenesses. Hard to pulverize materials such as burned lime and phenolic resins; sticky materials such as titanium and iron oxides; and inflammable materials such as sulphur are handled as standard operations with this unit.

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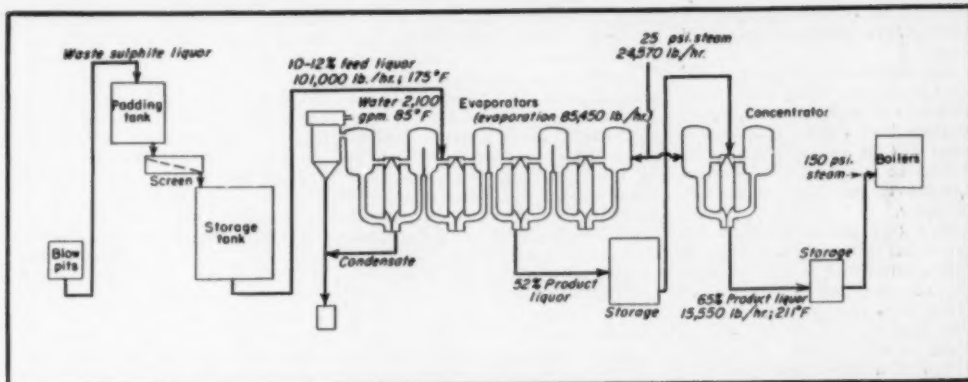
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OPERATION: Here's how waste sulphite liquor will be concentrated in the new evaporators and burned to produce steam.

New Evaporator Licks Effluent Woes of Pulpers

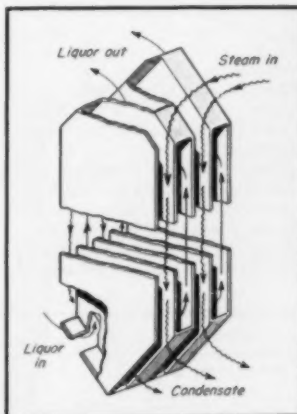
Mills can now get rid of waste sulphite liquor by concentrating and burning it.

To reduce stream pollution, pulp and paper makers will evaporate and burn waste sulphite liquor from their mills. Under pressure by the state to keep the Fox River clean, four Wisconsin mills will spend close to \$5 million to install evaporating and burning equipment.

Up to now, no evaporator could withstand the gypsum scaling that results from evaporating sulphite liquor. Rapid fouling of the heating surface, with consequent frequent shutdowns, made evaporation of this liquor a costly and impractical procedure.

Now, a new type of evaporator makes it possible to clean the heating surface while the evaporator continues in operation at full capacity. It's the Conkey flat plate heating surface evaporator utilizing the Rosenblad channel switching system. Fundamental design change in this evaporator, which is made by General American Transportation Corp., is the use of flat plates instead of tubes for the heating surface. This makes possible a novel switching system that prevents scaling.

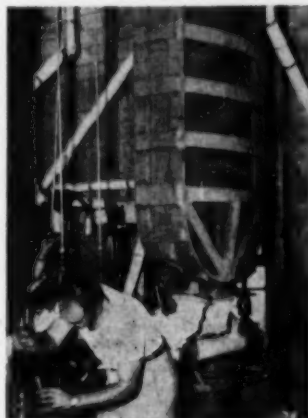
The liquor and steam sides of the evaporator are periodically switched.



HEART: for the switch, flat plates.

Thus all evaporator surfaces previously fouled by the boiling liquor are regularly washed clean by the dissolving action of steam and condensate. Not just heating surfaces but all parts—vessels, pumps, valves and piping—are switched and washed to keep them from fouling and eventually plugging. All it takes to make this switch is a quick shutdown and the adjustment of five pairs of valves. How often must the switch be made? That depends on how fast scale forms and how fast it's washed free. In practice, the switch is often made at the change of shifts.

This method was developed by Curt Rosenblad, Swedish engineer who now heads up two companies bearing his



FIRST in U. S.: Interlake pilot unit.

name, one in Stockholm and the other in New York, his present headquarters. General American is sole U. S. licensee for the Rosenblad channel switching system. General American's Conkey flat plate heating surface switching evaporators will be used by the pulp mills to evaporate sulphite liquor.

These evaporators have been used successfully for about six years in Swedish sulphite pulp mills, but they're new in the United States. A successful pilot-plant trial of this system in the United States has been made at the Interlake mill of Consolidated Water Power & Paper Co. at Appleton, Wis., where General American (Continued)

can installed a small one-effect evaporator that's been operating for about a year and a half. The Sulphite Pulp Manufacturers' Research League (of Wisconsin and Michigan) sponsored the trial.

Crown-Zellerbach Corp. at Lebanon, Ore., is now using such an installation in an ammonia base pulping operation. And Puget Sound Pulp & Timber Co. at Bellingham, Wash., will soon be operating a single-effect evaporator of this type on calcium base liquor.

Unless they get an extension because of the defense-born shortage of stainless steel, the four Wisconsin mills must have their evaporating and burning units completed by the end of this year.

First multiple-effect installation will be that of Rhinelander Paper Co., a triple-effect evaporator for its Rhinelander, Wis., mill that will handle effluent from half the daily production of 100 tons of pulp or about 500 tons of spent liquor per day. The rest of the spent liquor is presently being processed in a Torula yeast plant. The new equipment will handle not only raw liquor, but also yeast plant effluent if necessary. No boiler expansion is required at Rhinelander. Evaporation and burning equipment will cost about \$250,000.

Hoberg Paper Mills at Green Bay, Wis., dropped plans for a yeast plant when the yeast market tumbled, now is planning to put up a \$1.25 million calcium base waste liquor evaporating and burning plant. Hoberg's mill produces 120 tons of pulp a day.

At its 140-ton-a-day pulp mill at Appleton, Wis., Consolidated Water Power & Paper Co. will install evaporators for calcium base liquor and reconstruct the combustion chambers of two existing boilers and equip them with liquor-burning jets. If this mill trial at Appleton is successful, Consolidated will build a similar evaporating and burning plant at its larger 180-ton sulphite mill on the Wisconsin at Wisconsin Rapids.

Northern Paper Mills at Green Bay, Wis., has ordered \$1.5 million worth of equipment to handle roughly 1,200 tons of spent liquor effluent from its 130-ton-a-day pulp mill. Northern will get a General American flat plate evaporator with the Rosenblad switching system. It will be a quadruple-effect evaporator with five vapor bodies. An existing boiler will be equipped with atomizing burners.

Instead of padding or washing with water, blow pits will be padded with liquor from a previous cook before a

blow. This will decrease dilution of spent liquor; it will average 10 percent solids. Each pit will be equipped to pump liquor to a 10,000-gal. stainless steel padding tank, then through a screen to a 100,000-gal. wooden storage tank. This is sufficient for five digester blows or 12-hr. collection.

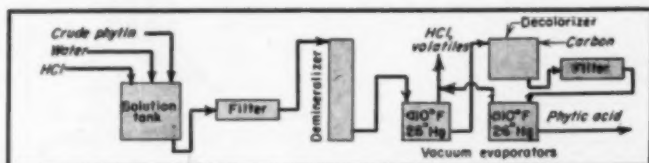
From storage, the liquor at 10-12 percent solids goes to the General American evaporator, where it will be concentrated to 52 percent. It then passes through a concentrator, which has two vapor bodies and is also of the reversing type, for further concentration to 60-65 percent solids. A total of 101,000 lb. of liquor at 10 percent solids will be evaporated hourly and stored at about 200 deg. F. in a 2,000-gal. tank next to the boilers. This 65 percent product liquor will be injected into the boilers by 150-psi. steam and burned. It produces about 8,000 Btu. per lb. of dry solids. One-quarter to one-third of the steam generated is used in the evaporation of the sulphite liquor, the rest is available for plant use. The four-digester, 130-ton-a-day Northern sulphite mill expects to reduce its river polluting effects by 40-45 percent.

This new evaporator is made up of a vapor body with a separating chamber big enough for the boiling liquid to release its vapor, a heating element inclosed in a reinforcing shell and utilizing flat plates for heat transfer surface, and a recirculation line from the lowest point in the vapor body to the bottom of the heating element. In forced circulation de-

signs, a high-capacity pump in the recirculation line imparts high liquid velocity across the heating surface.

The heating surface is built up of thin plates face to face at a fixed distance from one another. An odd number of these long vertical hexagonal plates creates an even number of channels. At the top and bottom every second channel is open at the left side and welded tight at the right side. The other channels are just the opposite—open at the right side at the top and bottom and welded tight at the left side. Thus through every other channel passes steam for heating, with alternate channels carrying liquor being evaporated. Steam enters at the top, where two headers connect to the two separating chambers. This steam moves down through alternate channels from the top and condensate comes off at the bottom. Liquor being evaporated enters at the bottom and rises through the other channels. There are two headers at the bottom with connections and valves for switching the liquor and the condensate lines.

This channel switching system is designed for use where scale is deposited on the heating surface during evaporation due to inverted solubility of dissolved salts. Other possible uses: for salt evaporators operating on high-gypsum brine (1.5 percent); for xylose (the H₂SO₄ solution of the sugar is limed, giving CaSO₄ scale during evaporation); and for concentrating phosphoric acid (from a solution containing Ca and SO₄ ions).



PROCESS developed by Northern Laboratory gets phytic acid from crude phytin.

For Phytic Acid, a Future

Its effectiveness in combating metallic contamination may be a boon to edible oil processors. Hence the quickened interest in this new process for making it.

Today, phytic acid is a custom-made chemical. But it's just possible that it might soon become commercial. Reason: the Department of Agriculture's Northern Regional Research Laboratory at Peoria, Ill., finds that it has advantages over citric and phosphoric acids for use in controlling me-

tallic contamination of edible oils. And the Northern Laboratory has come up with a new process for making phytic acid.

Independently, Corn Products Refining Co., sole present producer (and only on a custom basis), is experi-

(Continued on page 184)

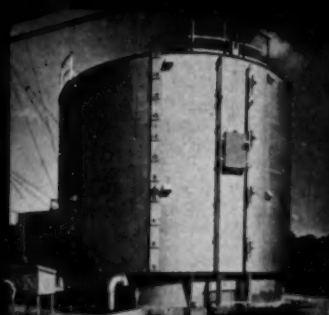
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(May, 1951), AMERICAN GAS ASSOCIATION



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News, cont. . .

menting with process modifications of its own, may embody them in actual manufacturing if demand, sparked by this new application in edible oils, warrants.

The deleterious effect of metallic contamination on edible oils has only recently been recognized. Many patented antioxidants or metal deactivators are known to contain considerable phytin, which is $\text{CaMg}(\text{C}_6\text{H}_5\text{O}_7)_2$, or calcium magnesium anhydro-oxymethylene diphosphate.

Phytic acid, in concentrations even lower than normally present in many foods, is highly effective in controlling metallic contamination, the Northern Laboratory finds. Citric and phosphoric acids have been approved for food use, but both have certain disadvantages. Phosphoric acid, in excess of a very low critical concentration, develops or imparts an unwanted foreign taste in edible soybean oil. For this reason, citric acid is preferred. But

citric decomposes during the deodorization and hence more must be added to protect the oil from contamination after processing.

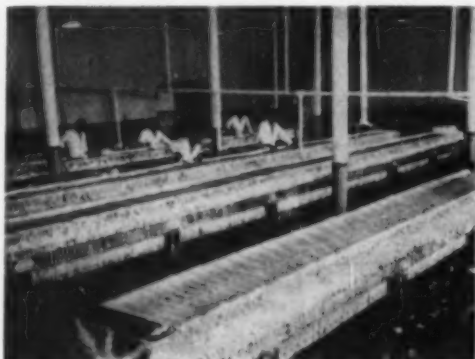
Phytic acid, when used as recommended, apparently possesses neither of these disadvantages. It is stable to deodorization and does not affect food tastes when below 0.1 percent concentration.

In the form of phytin, phytic acid is a natural constituent of cereal grains and oilseeds. Phytin appears to be concentrated in the bran coat of the seeds. Antioxidant preparations made from bran undoubtedly owe some of their efficacy to this constituent. Crude phytin is obtained from corn steep liquor (see *Chem. Eng.*, July 1951, p. 200).

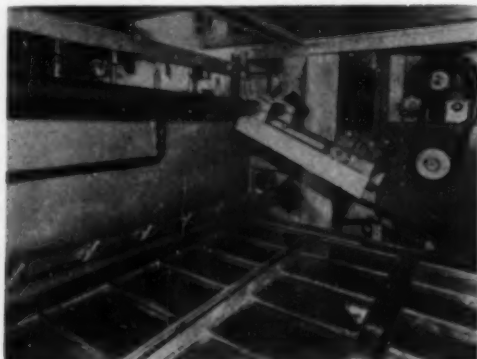
Demand for phytic has been very light up to now; it's only manufactured on a custom basis when requested. Its possible use in edible oils has stimulated interest, however, and samples are now being sought. The phytic used in the Northern Labora-

tory tests was supplied in part by Corn Products, which has since furnished samples to edible oil manufacturers. The rest of the acid for the tests was made by the Northern Laboratory by its own process (see *flowsheet*).

Crude phytin is dissolved in 6 percent HCl and the solution is then diluted to 1-2 percent HCl, filtered to remove insolubles, and demineralized by an ion exchange resin that removes Ca, Mg and other metals. Next, it is evaporated under a vacuum of 26 in. Hg at a temperature less than 110 deg. F. This removes practically all the HCl. Darkening occurs during this HCl stripping, so the material is slurried with carbon to decolorize it, then filtered. A final evaporation, also under 26 in. Hg and at less than 110 deg. F., takes out more HCl and concentrates the phytic acid. A strong acid, phytic in its purified state is quite stable. This new process of the Northern Laboratory is under study at present for possible improvement should demand increase.



OLD: Paraffin wax presses have molds and cooling plates.



NEW: Wax injected into pans goes through multi-tier cooler.

Ingenuity Pays Off . . .

. . . as petroleum engineers study the chocolate industry, come up with a novel way to mold wax. Simple and continuous, it slashes labor, floor space and losses.

Magnolia Petroleum Co.'s engineers weren't sold on the usual batch way (see cut) of molding their paraffin waxes. They considered it sloppy and wasteful, badly in need of streamlining. Yet it was how the petroleum industry had been doing it, with few changes, for decades.

So they scouted around for fresh ideas, showed their ingenuity by taking a good look at how other industries solved their molding problems.

Jackpot idea came when they bumped into a continuous chocolate molding machine sold by J. W. Greer Co. of Cambridge, Mass. Could they modify it and come up with the answer to their problems?

Chances are good, they reasoned. So Magnolia's chemical engineers and Greer's food engineers worked together. Upshot of it all is a continuous wax molding system—considered revolutionary by the petroleum wax

industry—that's now operating at Magnolia's Beaumont, Tex., refinery. It's the first commercial system of its kind.

The new process—which Magnolia has now operated for a little over six months—has panned out to be a big success, says V. A. Kalichevsky,* consulting chemical engineer to Magnolia's refining division.

WHAT IT DOES

Magnolia's new molding set-up can now turn out—and turn out continuous—
(Continued)

*Who described the process, together with L. H. Jennings and J. H. Beard of Magnolia's refining division, at last month's meeting of the Western Petroleum Refiners Association in Wichita, Kan.



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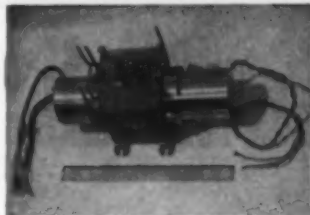


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News, cont. . .

ously—between 11,000–17,000 lb. per hr. of paraffin waxes. (Its capacity depends on melting point of the wax.)

What's more important, the system shows clear-cut advantages over the conventional batch method:

► Losses of wax from overweight slabs have been cut from an average of about 5 percent to some 0.2 percent of the slab weight.

► Labor requirements per unit weight of molded wax have been slashed five-fold—with more savings in sight.

► Floor space for the equipment is 10 percent or less of that normally needed for molding presses—and can be cut down more by increasing the height of the cooling chamber.

► Sloppy appearance of the conventional wax molding rooms—with the inevitable spills on the floor and equipment—is practically eliminated.

► Reject of cakes because of off-weight or off-grade appearance has been eliminated. The new-type cakes are so uniform in size that Magnolia now operates without any weighing device.

► The entire system is continuous, while the batch press-type molds require a cooling period of 2-3 hr., depending on the wax's melting point and the temperature of the cooling water.

► By putting in automatic packaging and car-loading facilities, the system can turn out a completely sanitary product for the food field—a product untouched by human hands from the time the crude oil is pumped out of the earth until the customer takes the wax slab out of its paper box.

WHY IT'S IMPORTANT

Magnolia's process is important because it now enables the petroleum refiner to use a better method of turning out better petroleum wax products for a rapidly expanding market. This is shown by the fact that two new plants to use the improved process are already being built.

Meanwhile, the petroleum wax industry continues to grow: total output for this year will top 500,000 tons—an increase of some 30-40 percent over the last decade.

More than 50 percent of this total output will be paraffin waxes of various melting points. Of the industry's production of these waxes, processed paper will use close to 75 percent. The remainder will go into manufacture of electrical insulation, candles, textiles, leather, cosmetics, lumber and formulated polish products.

Perhaps more important, the new molding technique—now available to industry on a license basis—will al-

most certainly find other uses in chemical processing operations.

HOW IT WORKS

Here's how the Magnolia system works on paraffin waxes. Molten wax from insulated and steam-heated charge tanks is pumped through automatically controlled "tempering" exchangers to bring its temperature to 140-160 deg. F., depending on its melting point. The exchangers, which operate both as heaters and coolers, keep the wax stream at an even temperature.

Liquid wax then goes to the steam-jacketed "depositor hopper"—an open rectangular tank with a partially sloping bottom. The wax level is automatically regulated.

The flat-bottom part of the hopper has six pistons that act as measuring devices. These easily-adjustable pistons can discharge up to 12 lb. of wax into each molding pan. Weight of the wax to the pans varies less than 0.5 oz. between fillings.

The molding pans rest on trays that move on a chain conveyor. Each tray holds six pans corresponding to the six pistons. Each pan is $19 \times 12 \times 2$ in. The Magnolia unit has 2,508 pans in continuous circulation.

Wax-filled trays (see cut) are carried through cooling compartments where a stream of cold air blows down onto the wax and solidifies it into cakes. Air is cooled by passing it over five dry-coil evaporators connected to an ammonia compressor.

The cooling chamber is completely inclosed and insulated; air is recirculated in the system. Air temperature is kept at 20-30 deg. F. The rate of wax cooling is controlled automatically by varying the conveyor's speed; it depends on the melting point of the wax.

After the conveyor reaches the opposite wall of the cooling chamber the trays are automatically lifted and transferred to the next higher level of the same conveyor to move in the opposite direction. This is done so smoothly that no wrinkles form on the surface of the solidifying wax.

This doubling of the conveyor may be repeated many times to make the cooling section more compact by substituting height for length.

Magnolia's trays make 14 passes through the cooler, travel about 800 ft. in a space 64 ft. long and 10 ft. high. The entire molding unit is driven by a 10-hp. motor. Wax may stay in the cooler anywhere from 1-3 hr., depending on the speed of the main drive gear.

Surface temperature of the cakes leaving the cooling chamber is kept between 60-80 deg. F., the lower the
(Continued)



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THE PERFECT SEAL

News, cont. . .

melting point the lower the temperature of discharge.

Wax cakes are removed by automatically tilting the pans (which are attached to the trays) until they are upside down. The chain conveyor makes another turn and the trays and pans go back into position. Bottoms and sides of the empty pans are heated slightly by passing the trays over an electric heater. The pans then start another cycle through the system.

Wax cakes dropped from the pans are picked up by a belt conveyor. They are then packaged in paper boxes and shipped.

New Alkylation Unit in Texas Will Make Aviation Gasoline

A sulphuric acid alkylation plant will be built at the El Paso, Tex., refinery as part of the Standard Oil Co. of Texas's current expansion program there. The unit will produce high-octane aviation gasoline from a mixture of butylene, propylene and isobutane vapors. Each day, it will turn out 1,400 bbl. of gasoline with an octane rating of approximately 100/130.

Cost of the alkylation plant will be upwards of \$1 million. M. W. Kellogg Co. has the contract for the design, engineering and procurement of materials. Catalytic Construction Co. of Philadelphia will build the unit.

Of the most modern design, the plant will employ the cascade-type reactor and motor-driven agitators for mixing the hydrocarbons with the acid. Construction will start this fall.



FLYING SPRAYGUN

Spraying chemicals from the air is the job this plane is designed for. Even though about 5,000 war surplus and other planes are used for that purpose, this is the first one designed exclusively for agricultural use. Built at Texas A & M for the Civil Aeronautics Administration, it can carry up to 1,200 lb. of spray or dust. Most fertilizers are heavy, but concentrated aqua ammonia fertilizers can be spread economically from the air. Widespread use of the new plane promises to sell more agricultural chemicals. Since the inception of aerial spraying, half a billion pounds of chemicals, it's estimated, have been spread by plane over U. S. farm land.

New Unit Now Extracting Oil At Glidden's California Plant

At its Buena Park, Calif., plant Glidden Co. now has in operation a new Exsolex oil mill. It extracts oil from flaxseed, soybeans and other oleaginous materials.

The plant employs the Exsolex process of V. D. Anderson Co. This method combines Pre-Expellers and solvent extraction to get oil from such materials as cottonseed and flaxseed.

(Continued)

CONVENTION CALENDAR

American Chemical Society, Fertilizer Chemistry Division, fertilizer technology symposium, Martinique Hotel, New York, September 6-7.

International Congress of Pure & Applied Chemistry, New York, September 9-11.

American Institute of Chemical Engineers, regional meeting, Sheraton Hotel, Rochester, N. Y., September 16-19.

Food, Drug & Cosmetic Law Division, American Bar Association, annual meeting, New York University Law Center, New York, September 19-20.

Drug, Chemical & Allied Trades Section, New York Board of Trade, annual meeting, Shawnee-on-Delaware, Pa., September 20-22.

American Oil Chemists' Society, fall meeting, Edgewater Beach Hotel, Chicago, October 8-10.

World Metallurgical Congress, in conjunction with National Metal Congress and National Metal Exposition, Detroit, October 15-19.

American Association of Textile Chemists & Colorists, annual meeting, Statler Hotel, New York, October 17-19.

Association of Consulting Chemists & Chemical Engineers, annual meeting, Shelburne Hotel, New York, October 23.

National Paint, Varnish & Lacquer Association, Chalfonte-Haddon Hall, Atlantic City, October 29-31.

National Pest Control Association, annual meeting, Statler Hotel, Boston, October 29-31.

Federation of Paint & Varnish Production Clubs, annual meeting, Chalfonte-Haddon Hall, Atlantic City, November 1-3.

American Petroleum Institute, annual meeting, Chicago, November 5-8.

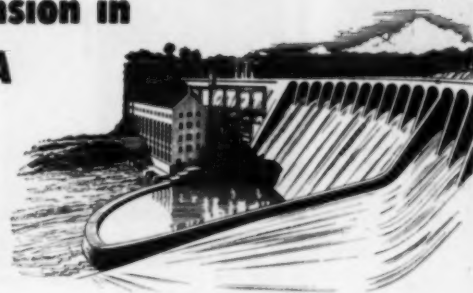
23rd Exposition of Chemical Industries, Grand Central Palace, New York, November 26-December 1.

Chemical Specialties Manufacturers Association, annual meeting, Mayflower Hotel, Washington, D. C., December 2-4.

American Institute of Chemical Engineers, annual meeting, Chalfonte-Haddon Hall, December 2-5.

Manufacturing Chemists' Association, semi-annual meeting, Waldorf-Astoria Hotel, New York, December 13.

Why ALABAMA POWER COMPANY is Spending \$100,000,000 for Expansion in ALABAMA



Thomas W. Martin, Chairman of the Board of Alabama Power Company, recently announced a record-breaking three-year program of expansion of \$100,000,000.

In a statement announcing the decision of the Company to spend this unprecedented sum for new construction, Chairman Martin said:

"No region in America has matched the Southeast's dynamic progress in the past two decades. The Southeast has outgained all sections of the nation in percentage of increase in per capita earnings and is now being generally acclaimed as the region of tomorrow's greatest opportunities for growth.

"Birmingham is the central city of the Southeastern States. It has outstanding manufacturing and distributing advantages for companies that are decentralizing, manufacturers that are broadening production, and firms which wish to put sales offices in the center of the growing Southeast consumer market. Among these are abundant raw materials and labor, a web of transportation facilities, low-cost fuels and power, and a most reasonable tax rate.

"Birmingham and Alabama have experienced their greatest industrial development in the postwar period. Studies made by our Company forecast continuation and acceleration of this progress in the period ahead. This is why we estimate the expenditure of more than \$100,000,000 over a three-year period for expansion of our Company's facilities in Alabama."

* * * * *



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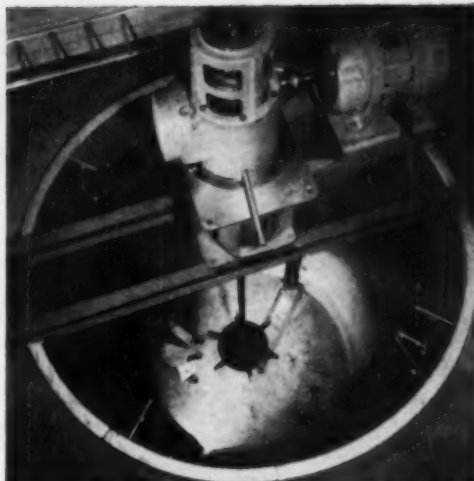
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SCALE model mixer agitates customer's paper stock sample while laboratory engineer jots down data during test run.



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Stepwise Attack to Solve Mixing Problems

Is fluid mixing an integral—or controlling—part of your process? Then you want to hear about these latest techniques to scale up lab results to plant size.

What's probably the country's largest and best equipped fluid agitation laboratory has now been completed and is in constant use. It's the pride and joy—and rightly so—of the engineers at Mixing Equipment Co., Rochester, N. Y.

This brand new research and development laboratory was set up with three purposes in mind: (1) to enable Mixing Equipment's engineers to develop more basic information on fluid mixing as a unit operation; (2) to reduce these findings to practice and to translate them into bettering the design and performance of the firm's line of mixing equipment; (3) to help customers solve their agitation problems, simple or knotty.

Mixing Equipment saw to it that the set-up was as modern, complete and flexible as possible. "After all, our entire activities hinge around fluid agitation," says Chief Engineer Richard Boutros, "and we concentrate everything we've got on learning more about this unit operation."

"And now," points out J. Y. Oldshue, development engineer in charge of the new laboratory, "we believe we have everything that's needed to scale up—and scale up accurately—almost any fluid mixing job from glass beaker to commercial plant. And I mean without scaling up all those little inaccuracies that're bound to crop up in small-scale work."

Tank sizes, for example, range from 1 qt. to 10,000 gal.—a volume scale-up of 40,000. The dynamometers cover a 10,000-fold range from 0.01 to 100 hp. at speeds from 4 right up to 4,000 rpm.

Strain gages designed as torque-meters have capacities that range from 100 to 30,000 in.-lb. Torque is recorded electronically on a strip chart.

Up to 32 input variables, such as temperature and speed, can be recorded continuously by a high-speed potentiometer. A special ultra-high-speed motion picture photographic set-up allows flow patterns to be seen in detail at slow motion.

Equipment in the laboratory includes strain-gage and mechanical dynamometers as well as a large variety of viscosimeters, tachometers, motor controls, electrical measuring instruments and other apparatus.

HOW DO YOU DO IT?

We asked Dr. Oldshue to tell us how he would go about scaling up a typical fluid mixing job. Here's his story:

"Well, one day a paper company asked us to design an agitator for mixing a paper pulp stock in a vertical cylindrical tank. That was a pretty tough assignment since the slurry had peculiar fluid properties. But the same methods of attack can generally be used on all types of processes—

heat transfer, liquid-liquid contacting, gas-liquid contacting and other fluid mixing problems.

"So we tackled this job in the usual two-stage approach: (1) first find out the process power requirements—usually known as sizing; (2) then find out the impeller power requirements—from which you can determine the most suitable combination of impeller, shaft, drive and motor as well as predict how process changes in the plant will affect the power consumption of the impellers.

"We started off with our 1-qt. container that's equipped with a scale model Lightnin Mixer. From this we determined the desirable flow patterns.

"Our preliminary tests on the paper stock at various impeller speeds showed a definite threshold of power required to give surface movement. This minimum power input gave good top-to-bottom turnover. The color change of an indicator showed the uniformity of the agitation. Higher inputs produced a swirl pattern with poor top-to-bottom turnover.

"Then we tried out various impeller types and positions in an 18-in. transparent plastic tank. We measured the power needed to rotate the impeller on a 1.5-hp. variable speed differential dynamometer. We picked out the three most suitable impeller types and positions.

"We then scaled up to a 29-in. tank; this narrowed our choice to one impeller type and one position. This time we made our power readings on
(Continued)

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News, cont. . .

a 7.5-hp. differential dynamometer.

"Our next job was to investigate the effect of the impeller-to-tank-diameter ratio. This gave us the process power requirements as a function of impeller size, allowed us to pick a nominal size impeller for plant installation.

MEASURE POWER

"A key step in the study was to get the relationship of the power needed for satisfactory agitation as a function of tank size. Holding the tank and impeller dimensionally similar (essential in any scale-up job) we varied the tank capacity from 18 gal. to 3,000 gal. in four steps. We studied several paper stocks at consistencies of 1 to 6 percent by weight.

"To measure the power input of the 3,000-gal. batches, we used a 30,000 in.-lb. Baldwin strain gage mounted on a special assembly with a standard Lightning Mixer drive. This torque-meter has a capacity of 7.5 hp. at 16.5 rpm., 50 hp. at 100 rpm., and 125 hp. at 280 rpm. We used one of our own standard reducers with change gears to give 16 speeds (from 16.5 to 420 rpm.) when driven at 1,750 rpm.

"Another thing we had to find out was the power needed to rotate the impellers at various speeds as a function of fluid properties. We did this for dimensionally similar impellers of 5-54 in. diameters.

RESEARCH BYPRODUCT

"By the way, our use of clear plastic tanks led to a discovery that is already saving money for some plants. By carefully adjusting the power input, the lower part of the tank can get uniform agitation while the top portion remains relatively stagnant. Stock in the upper part is drawn continuously into the agitated zone.

"Upshot of this 'byproduct' of our research project is that many installations can now be smaller than if the entire contents of the tank had to be agitated. This naturally saves money for the pulp mills.

"The mixer we finally selected for our client's plant was delivered as a packaged unit, aligned and ready to mount on the tank for immediate operation. It was covered by a guarantee that relieved him of all responsibility for its successful performance.

"So that's how we did the job of scaling-up a pulp stock mixer unit from a 1 qt. container to a 10,000 gal. tank.

"Go higher? Sure, we can—and have—extrapolated to tank sizes up to 300,000 gal. Several of them are being used successfully right now in pulp mills."

Improved Filtration Possible Using New Synthetic Fibers

One way to save scarce materials is to filter them more efficiently from the air. And the secret of improved filtration lies in the use of filter cloths made from such new synthetic fibers as Orlon. To find applications for these new filter cloths, Whitehouse Products, Inc., Brooklyn, N. Y., is organizing a new Industrial Fabrics Division headed by W. W. Criswell.

Filtration systems are being used more and more widely in metallurgical and chemical industries to recover valuable materials from gas streams and from the plant atmosphere, according to Criswell. "Cotton and wool," he points out, "are commonly used as filter bag materials, but they have relatively low resistance to acid fumes and to high temperatures compared with the new synthetics. By extending the field of application of the cloth filter, due to the higher temperature and the chemical resistance of the cloth, industry has available equipment which gives it the ultimate in recovery efficiency."

"As defense needs for critical materials increase," Criswell believes, "the use of synthetics to improve recovery methods for such materials as cadmium, zinc, lead and carbon black seems inevitable." Improved recovery of resins and powdered food products is now possible.

"Commercial tests at one plant manufacturing carbon black showed that the introduction of Orlon as a filter bag material increased recovery efficiency from 10 to 15 percent—the difference between operating at a profit or loss and also increasing the supply of a critical item," reports Criswell.

"Developmental work beyond filtration recovery applications is anticipated by Whitehouse, using new synthetic fibers. For example, dust control in plants and the reduction of smoke in industrial areas are other immediate possibilities. A large metal producer tested the use of Orlon dust collectors in one of its roasting processes where acid fumes were created. The chemical resistance properties of this fiber made it possible to keep filter bags on the job much longer and reduced filter maintenance costs nearly 50 percent," says Criswell.

Whitehouse Products has worked closely with the chemical industry in its engineering and developmental work on industrial synthetic materials. Whitehouse is the largest industrial user of nylon, having pioneered in the introduction of nylon products to the commercial laundry and dry cleaning industry.

(Continued)

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NUB OF PROCESS: Rolling moist taconite concentrate in drum to form pellets.

Unit Operations Score Again

This time they go to work for the steel industry to insure capacity output of tomorrow's steel by getting a usable iron ore from abundant but tough and flinty taconite.

In vast U.S. reserves of tough taconite rock is locked the future of America's big and expanding steel industry. Major steel companies are going all-out in their efforts to get from taconite a rich iron ore for use in hungry blast furnaces. The job is to crush and grind the rock to a fine powder, separate the iron particles magnetically or by other means, form this powder into chunks or balls, and use them in a blast furnace.

Two pilot plants for beneficiating taconite are already running. Two more are building. Plans for the first commercial plant have been announced, and another is under consideration.

World War II ate up U.S. iron ore reserves. Since the war steel capacity has climbed higher than 100 million tons per year, will reach over 117 million tons by the end of 1952. And it takes about 1.36 tons of ore to make a ton of steel. So Lake Superior reserves, which account for 80 percent of high-grade ore production, can last only a few more years. New sources in Venezuela, Liberia and Labrador pose a costly transportation problem even in peacetime. What's needed is an abundant U.S. source of ore in a hurry, and that's taconite.

There's plenty of taconite, billions of tons, enough to turn out 10 times the steel the U.S. has produced in all its history. But it contains only about 25 percent iron, much of it finely dispersed through some of the hardest rock on the North American continent. The taconite lies in the Mesabi Range in a solid bed thousands of feet wide, up to 200 ft. thick and 100 mi. or more long. Most of it is non-magnetic taconite, the toughest to get iron ore out of on a commercial basis. At the eastern end of the strip, however, lies about 5 billion tons of magnetic taconite, which is more tractable.

First successful batch of little black iron ore pellets was made from taconite rock in 1943. Pioneer re-

searchers were Dr. E. W. Davis and his associates at the University of Minnesota. They powdered taconite, ran it through several magnetic separations, filtered it and dried the black mud.

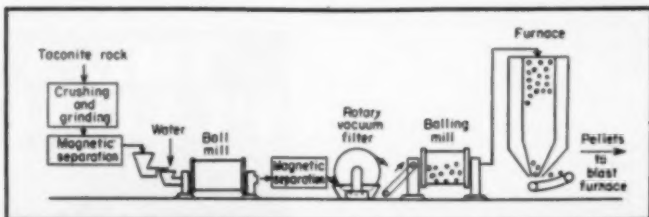
Then Davis conceived the core idea of the process: moistening the dry powder and rolling it into balls in a drum (see cut). Burning the moist balls in a furnace at about 2,300 deg. F. fused them into hard pellets.

For three years, Davis and his staff accumulated hundreds of tons of pellets. By April 1948 they had enough to test in a small blast furnace. When the pellets were fed into the furnace, good pig iron came out below. For the first time a practical way had been found to make iron from taconite rock.

In the laboratories of the big steel companies, others were also pushing taconite research. Before 1948 was out a pilot plant was begun at Aurora, Minn., for Bethlehem Steel and Youngstown Sheet & Tube. And in 1949 another went up at Ashland, Ky., for Republic, Armco and National Steel.

At the Ashland pilot plant taconite is crushed and the iron particles separated magnetically. Then ground concentrate is conveyed to a ball mill. There, with water added, the particles are ground by steel balls to flour fineness. They come out as a watery black soup. After another magnetic separation, the thickened soup is dewatered on a rotary vacuum filter with a nylon cloth. In the balling drum, muddy filter cake is rolled into greasy pellets 1 in. in diameter. These are loaded into the top of a furnace onto a bed of other pellets extending down 14 ft. to chutes and grates at the bottom. The gas-fired furnace heats the balls cherry-red as they move slowly downward. Fresh balls are loaded on top continually as burned balls are removed at the bottom, two stories below. Pellets are burned hard to remove all moisture. They've got to be strong enough to withstand freezing and thawing, as well as rough handling in transportation to the steel plants.

(Continued)



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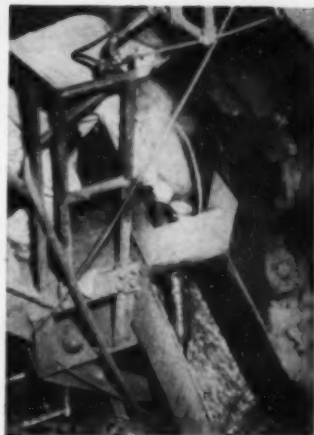
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SOUPY TACONITE from ball mill goes to magnetic separator, then is dewatered.

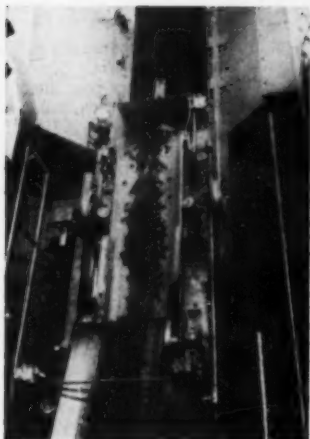
And they must have the qualities necessary for efficient blast furnace operation. The burned pellets are charged to a blast furnace to produce pig iron.

The pilot taconite beneficiation plant being built at Mountain Iron, Minn., by a U. S. Steel subsidiary will also separate fine particles of iron ore from the rock. This will be done by four steps of crushing, followed by two steps of grinding, after which the fine magnetic ore particles will be extracted by magnetic separators. Other equipment will separate the non-magnetic iron from the silica. After beneficiation, the powdery concentrates will be shipped to the agglomerating plant at Virginia, Minn., where they will be transformed into pieces the size of eggs. These will go by rail and ore boat to steel plants at the Lower Lakes for testing in large modern blast furnaces.

Still another taconite pilot plant is now under construction for Republic, Arco and National Steel near Babbitt, Minn. It will be the precursor of the first big commercial unit.

This pioneer joint full-scale commercial taconite plant will be built on the shore of Lake Superior at Beaver Bay, Minn. At an initial cost of \$70 million, enough capacity will be installed to produce 2.5 million tons of iron-rich pellets per year. But the plant will be laid out to make possible a fourfold expansion to a potential 10 million tons per year at a total outlay of \$160 million. The first 2.5 million ton unit at Beaver Bay is expected to be in operation in 1955.

The Beaver Bay project is big. A 47-mi. railroad has to be built through the wilderness to link the mine and the lakeside plant. The companies



PELLETS of taconite travel via feed carriage to furnace to be burned hard.

will carve out an entire harbor for the ore boats that will haul away the finished pellets. Two new towns of several thousand people will spring up.

Extracting and agglomerating the flour-fine particles of iron will call for staggering amounts of power and water. Crushers, grinders, mills, conveyors, drums and belts will use up 200 million kilowatt hours a year. Water to wash and carry the taconite through the many processes will come

(Continued)

Taconite's Who, What & Where

Research Is Going On In . . .

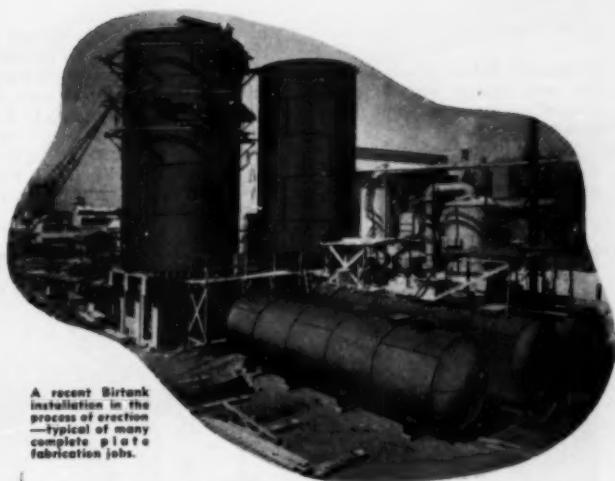
Duluth, Minn.—Biggest and best equipped laboratory of its kind. Oliver Mining Co. started research in the beneficiation of magnetic and non-magnetic taconites at Duluth about eight years ago.
Ishpeming, Mich.—Jones & Laughlin.
Coleman, Minn.—Cleveland Cliffs Iron Co.
Cooley, Minn.—M. A. Hanna Co.

Pellets Are Coming From . . .

Aurora, Minn.—Operated by Erie Mining Co., managed by Pickands, Mather & Co. Begun in 1948. Capacity: 500,000 tons annually. Pellets go to Youngstown, Ohio.
Lebanon, Pa.—Bethlehem Steel. On a small scale since 1948.
Ashland, Ky.—Operated by Reserve Mining Co., managed by Ogilby, Norton & Co. Went up in 1949. Cost: \$1 million. Capacity: 70,000 tons per year.
Virginia, Minn.—Experimental taconite agglomeration plant of Oliver Iron Mining Co. Begun early in 1950. Capacity: 1 million tons.
Mountain Iron, Minn.—Pilot plant of Oliver, a U. S. Steel subsidiary. Ready in the summer of 1952. Capacity: 600,000 tons of concentrates for the agglomerating plant at Virginia, Minn.
Babbitt, Minn.—Reserve Mining Co. should be operating by year's end. A 300,000 ton pilot plant for the big commercial unit at nearby Beaver Bay, Minn.

Commercial Plants Scheduled for . . .

Beaver Bay, Minn.—First full-scale commercial plant. To be operated by Reserve Mining Co. for Republic Steel, Armco and National Steel. By 1955: \$70 million unit, 2.5 million tons of pellets per year. Later: \$160 million, 10 million tons.
Aurora, Minn.—Beneficiation plant by Erie Mining Co. for Bethlehem Steel and Youngstown Sheet & Tube. 2.5 million tons.



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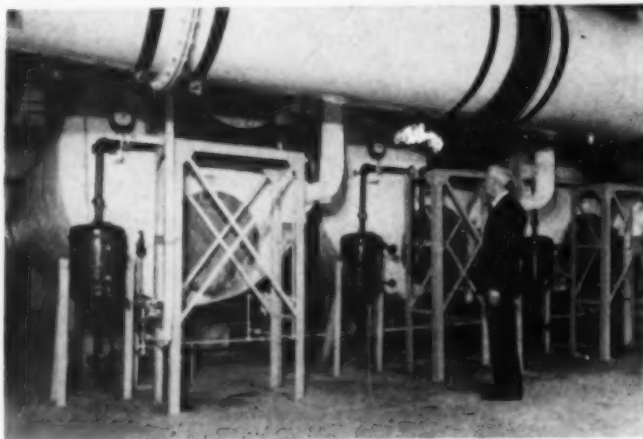
to about 35 billion gallons a year, and the sand tailings washed away and dumped each year will amount to 95 million cubic feet.

Even so, this is only the beginning. Big as it is, Beaver Bay will turn out only a fraction of the nation's ore

needs. The recent Labrador and Venezuela ore finds each will furnish perhaps 15 million tons of ore annually in a decade, but more taconite plants will have to be built to keep U. S. steel production from slumping. At Aurora, Minn., site of their present pilot plant, Bethlehem Steel and Youngstown Sheet & Tube may put up a ben-

eficiation plant to produce 2.5 million tons a year of usable ores.

As other companies pour their resources into taconite plants, pellet production will mount swiftly. Look for at least 20 million tons annually by 1960, over 40 million by 1970. To reach that, companies will have to invest more than \$750 million.



How Garlock Saves Solvent

Activated carbon unit recovers gasoline, reduces hazard, eliminates atmospheric pollution.

A new activated carbon solvent recovery plant for the Garlock Packing Co., Palmyra, N. Y., saves half a ton of gasoline an hour and delivers it ready for re-use. That's a 95 percent recovery. What's more, the installation improves working conditions, increases safety, avoids discharge of gasoline fumes into the surrounding area.

Garlock engineers first tried a condensation system to recover gasoline vaporized during the manufacture of their asbestos sheet packing. Results were unsatisfactory. Then they tried an oil absorption system which, when new, had an efficiency of 50 to 60 percent. This fell off to 25 percent after some years.

They investigated several processes and then called in Carbide & Carbon Chemicals Co. A pilot-plant test soon showed that savings on an activated carbon system would exceed those on a new oil absorption system. Carbide designed, built and put into operation the completely automatic plant which uses Columbia activated carbon.

A negative pressure is maintained

in the hoods over the sheeters or presses where the gasoline-containing mix is rolled into finished asbestos packing sheets. Vapor-laden air from the hoods moves through a 36-in. duct to the recovery building. Total volume is automatically controlled. Suction is at the optimum of 1 in. of water.

A gas analyzer continuously records concentration of solvent vapor in the main duct and sounds an alarm at one half the lower explosive limit.

Filter, cooler, adsorbers, condenser, decanter and control panel are in a ventilated fireproof building just outside the sheeting building. The renewable glass-fiber filter takes out asbestos fibers, sulphur, talc and other materials carried over from the sheeters. After passing through a finned-tube cooling and tempering unit, filtered vapor-laden air goes into the top of one of three adsorbers. Stripped exhaust air from the bottom is vented to the atmosphere. After an hour (saturation time) intake is automatically switched to another adsorber. Low-pressure steam sent

through the saturated bed drives out the adsorbed gasoline.

The steam and vapor mixture goes to a condenser and continuous decanter. Recovered gasoline is pumped to storage for re-use.

Shell Installs Unit to Make Petrochemical for Detergents

A plant for the production of dodecyl benzene is now on stream at the Wood River refinery of Shell Oil Co. Output of this alkylated aromatic will help to ease the tight supply of base materials for synthetic detergents.

The Wood River refinery, just outside St. Louis, is one of the nation's largest production centers for aviation and motor fuels and lubricants. Addition of the new installation there means that Shell Chemical Corp. can now include dodecyl benzene in the list of industrial chemicals it markets.

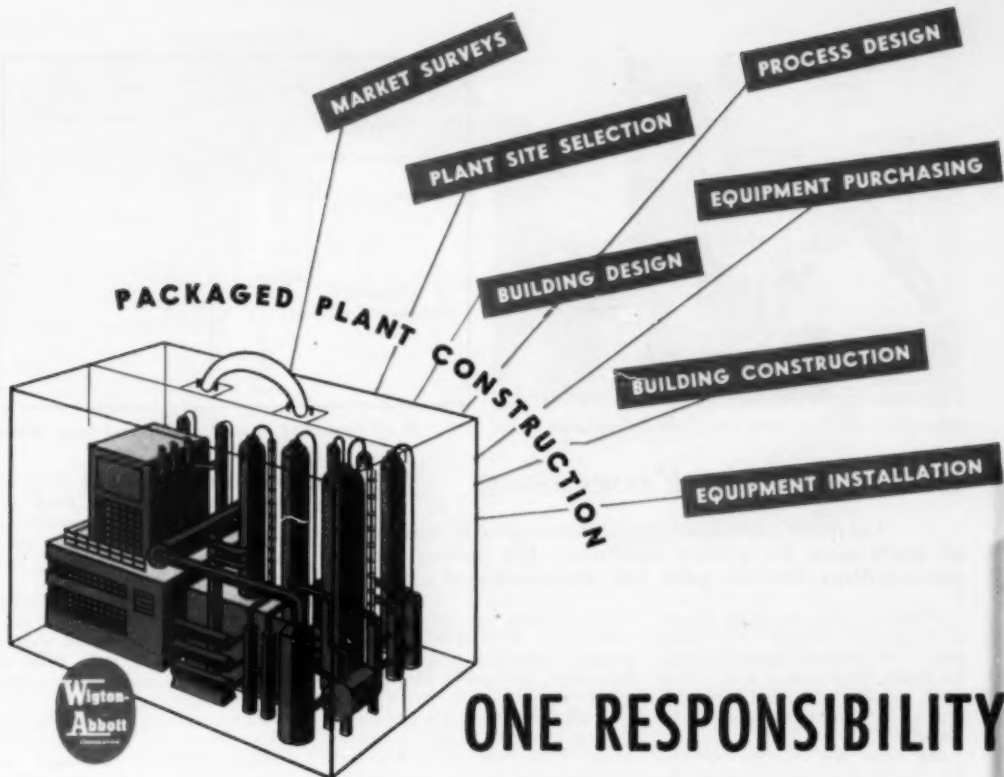
Dodecyl benzene goes into the soapless soaps used by housewives. Industry also uses these cleansing agents for a variety of jobs ranging from cleaning fruits and vegetables and the railroad cars that carry them, to preparing metals and textiles for processing. The armed forces, too, use similar synthetic detergents all over the world for efficient operation in salt or hard water.

Glidden Increases Capacity For Protein From Soybeans

Its Soya Products Division in Chicago will be expanded by the Glidden Co. at a cost of \$700,000. This will mean a 40 percent increase in output of alpha protein.

The alpha protein is used in paints, textile sizing, wallpaper coating, leather coating and various other coatings. Big World War II development was its application as a waterproofing adhesive for fiber boxes.

Use of the protein made the fiber boxes resistant to arctic and tropic weather, to mold and to boiling water. Modification allowed 24-hr. setting (other adhesives need days), immediate maturation and good resistance to adverse conditions even after prolonged storage. (Continued)



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To perform and to coordinate these complex functions, Wigton-Abbott Corporation employs the experience and skill of engineers and architects—including specialists in all branches of chemical, mechanical, electrical, civil and industrial engineering. The Construction Department is staffed and equipped to erect any type of industrial plant.

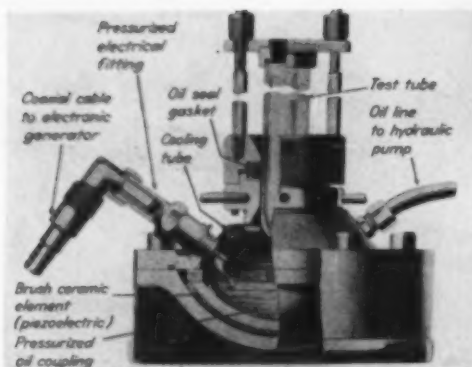
A Wigton-Abbott Corporation representative will be glad to consult with you on any phase of plant design and construction.



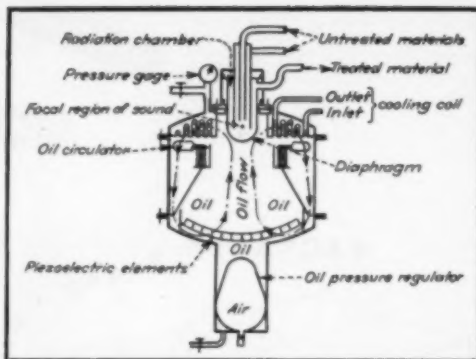
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TRANSDUCER is compact unit; generates ultrasonic waves.



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Ultrasonics in Processing

Cat-quiet and sure-footed, ultrasonics is landing on all fours amid the process industries. It's finding uses in paper mills, refineries, paint and pharmaceutical plants.

Ultrasonic waves are going to work in the process industries. First industrial use of ultrasonic equipment made by Brush Development Co., Cleveland, will be in treating paper mill wastes to remove suspended fiber particles.

But other jobs will soon be found for ultrasonics in industrial waste disposal, pharmaceutical manufacturing, paint making and petroleum refining. So far, Brush has explored only liquid and solid phase applications, feels it is on the threshold of something new and big.

Right now, Brush Hypersonic units are being installed as components of a water-treating plant for a paper mill. The tiny bits of fiber, too small to be picked up by screening, are a big reason for stream pollution complaints leveled at paper makers. They settle in streams, emit gases that kill fish.

With ultrasonics you can trap these elusive particles. Shoot a beam of these high-intensity waves at fiber-bearing waste water, and the fibers group and arrange themselves in soldier-like rows. Then the aligned particles are combed out of the mill wastes downstream of the ultrasonic equipment.

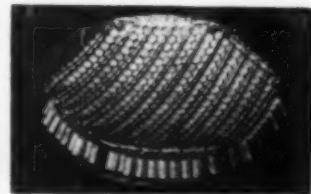
Brush first got into ultrasonics in October 1949, when it set up its Hypersonic Division to investigate applications in industrial processing and to design, engineer and manufacture tailor-made equipment for pilot-plant and full-scale commercial installations.

It's a tricky engineering job to come up with equipment for generating sound waves you can't hear. (The

average human ear picks up sound waves from 20 to 18,000 cycles per second; ultrasonic devices produce frequencies well above 30,000 cycles per second.)

Brush has developed a bench-sized unit for laboratory or pilot operations. Heart of this unit is the 2,000-watt transducer that converts electrical energy into mechanical energy. Sound waves are then transmitted through oil to the test tube or flask containing the material to be treated.

Cavitation, or formation of bubbles in the transmitting oil, occurs when the oil is at atmospheric pressure. These bubbles keep most of the waves from reaching the material under treatment. For certain ultrasonic operations, such as accelerating bacteria growth, internal heating, flocculation, crystallization and precipitation, you have to get rid of this cavitation. Oddly enough, however, certain other operations, such as emulsification, ultrasonic cleaning, disruption of pathogenic bacteria and sterilization, won't work without cavitation.



Ceramic piezoelectric element turns the electricity into high-frequency sound.

To get rid of cavitation in operations where it is unwanted, Brush has (1) developed its own piezoelectric element and (2) obtained a good coupling between transducer and material being treated.

With its new piezoelectric ceramic, barium titanate, Brush gets, after electrical polarization, frequencies up to 4 million cycles per second. Most of the company's transducers use a concave mosaic ceramic element.

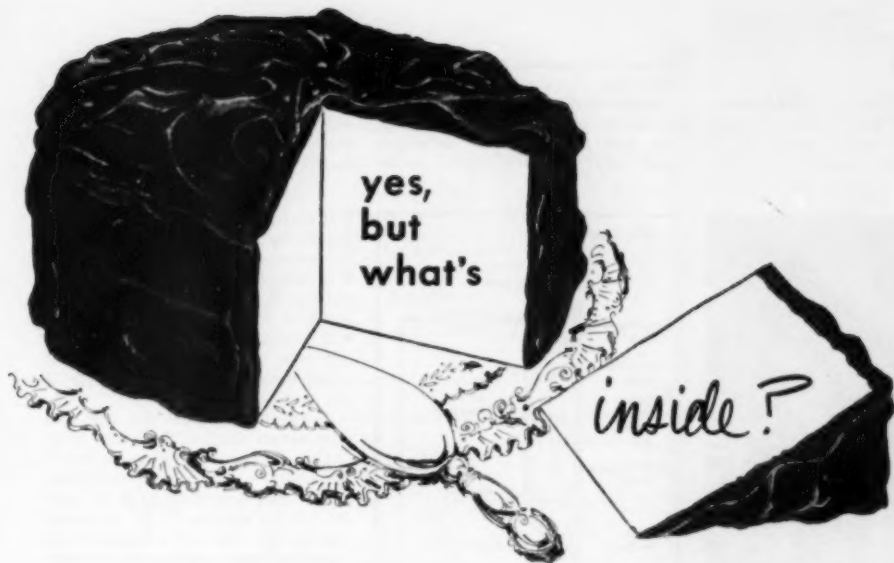
This concave shape focuses the pulsating energy in the transducer's radiation chamber. De-gassed oil, under pressure, couples the energy between the ceramic element and the radiation chamber. Precautions are taken to guard against entrapped air within the housing. A pump inside the transducer housing circulates the oil, further safeguarding against cavitation. Brush offers its pilot-sized transducer, together with electronic generator, for less than \$10,000.

Metals can be cleaned and de-gassed. In dry cleaning, ultrasonics can remove spots. Speedier laundering is promised, no matter what kind of detergent is used, in soft or hard water. The water can be used over and over.

It's in the process industries that the most exciting applications of ultrasonics will come. Brush keeps mum about these, won't even divulge names of clients. Enough is known, however, to give some idea of what Brush and other companies are doing.

One hot possibility: shooting the high-intensity waves through paint during its manufacture. This reduces particle agglomeration. It makes grinding easier. But of greater importance, it exposes much more pigment surface to wetting by the vehicle. One result: a glossy paint becomes even glossier, using the same materials.


(Continued)

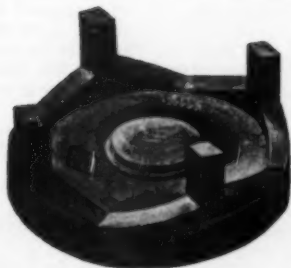


That's a good question to ask when choosing cake for dessert or when buying steel castings. After all . . . outward appearances can be deceiving and however enticing . . . cake or castings can be extremely disappointing if the inside isn't what you expected.

Sivyer research has always emphasized that internal integrity of metal is the biggest single factor in the service life of steel castings. To this end Sivyer Castings are produced under the most rigid controls known to this industry.





You can have your cake and eat it too . . . when you specify Sivyer. Look for the famous Sivyer  . . . your guarantee of sound steel castings.



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SPECIFICATION STEEL CASTINGS

SIVYER STEEL CASTING COMPANY • MILWAUKEE  CHICAGO 

News, cont. . .

In the pharmaceutical field, ultrasonic treatment helps in the separation and recovery of certain products. It makes possible finer and more uniform

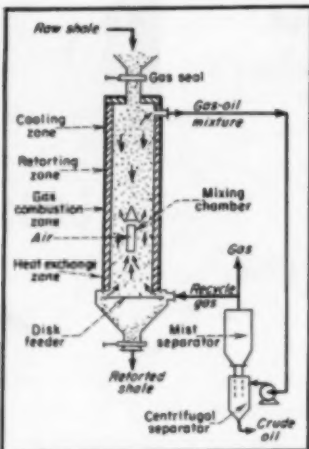
colloidal suspensions, especially of the antibiotics.

Many ultrasonic applications in the petroleum industry look as though they will pay off. The technique could help recover acid used in the

alkylation process for making high-octane gasoline. It also should prolong the life of costly catalysts. Silently but swiftly, ultrasonics is penetrating many industrial processes. Its achievements will be heard of.



WHAT the pilot plant retort looks like.



HOW gas-combustion retort will work.

High Hopes for Cheap Shale Oil

Bureau of Mines engineers believe they have at last a retort that'll tap the West's vast deposits of shale and put its oil on a dollar par with natural petroleum.

Another landmark has been reached in the U. S. Bureau of Mines' efforts to extract crude oil from the vast strata of oil-bearing shales that cover large areas of Colorado, Utah and other western states.

So promising is this latest BM development—a new gas-combustion retorting process—that “if the new retort operates as anticipated we have an excellent chance of producing crude shale oil at a cost competitive with natural petroleum,” says Boyd Guthrie, chief of the bureau's oil-shale demonstration plant at Rifle, Colo.

To prove the new continuous process, BM has just awarded a \$333,800 contract for the design and construction of a demonstration-scale retort at Rifle. The contract went to Blaw-Knox Construction Co., Pittsburgh. The new unit should be ready to operate by mid-1952.

Rifle's new demonstration retort will have a capacity range of 150–400 tons of oil shale daily. It will be patterned after a 6-ton pilot plant (see cut) that has already convinced BM's

engineers that the gas-combustion process is the most efficient and most economical ever tested at Rifle.

“We think that we've found just what we wanted,” Guthrie says, “for the test runs in our small pilot plant during the past six months have been most encouraging—good oil recoveries at high throughput rates.”

Major objectives of the new retorting plant are: (1) to determine cost and yield data that will permit an accurate evaluation of the process; (2) to provide the technical information that industry needs to design commercial plants; (3) to supply crude shale oil for the bureau's refining studies.

The new gas-combustion process has several important features:

► It produces its own source of heat—a low Btu. gas—for retorting the shale. Thus it is independent of outside sources of natural gas, coal or other fuel.

► It does not require water—a scarce commodity in the semi-arid regions where the nation's major oil-shale reserves occur.

► It uses a simple system for condensing the liquid products that come from the retort as a mist.

► It needs less investment and operating capital than any other process yet tested at Rifle.

► It is continuous, has a high thermal efficiency, provides for rapid heat transfer, recovers a high percentage of oil.

Briefly, here's how the new gas-combustion retort will work (see cut):

Crushed raw shale enters the top of the retort—a vertical, refractory-lined vessel—and flows through it by gravity. About midway in its downward passage, the shale bed is heated to the retorting temperature by hot combustion gases. These are generated by injecting air into a mixing chamber and burning the recycle gas. Spent shale leaves the retort at about 157 deg. F. after passing through a gas seal.

Cold product gas, introduced at the bottom of the retort, flows upward through the heat-exchange zone to be preheated by the hot spent shale. The gas then flows through the mixing chamber and into the combustion zone where the temperature is about 1,420 deg. F. Here it burns, together with some of the organic residue on the retorted shale, and passes into the retorting zone to heat the raw shale and cause conversion of its kerogen.

Oil vapors and shale gas pass through the cooling zone; the oil vapors condense into a mist that remains in the gas stream.

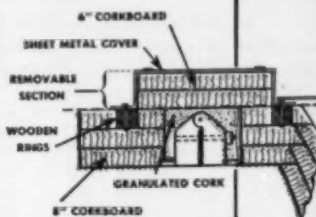
The oil-gas stream from the retort is repressed by a blower that causes most of the oil-mist particles to agglomerate. The oil is removed by a centrifugal separator and electrostatic mist separator. Part of the gas stream is recycled to the retort. The remainder is vented or burned to generate heat or power.

In pilot plant runs on a shale assaying 24 gal. of oil per ton, the total water-free oil recovered was 23.1 gal. per ton or 98.3 volume percent by Fischer assay. On a wet basis, the gas yield was 6,070 cu. ft. of 83-Btu. gas per ton of shale charged.

Crude shale oil from the gas-combustion process is somewhat inferior to the average petroleum. “But finished products of good quality can and will be refined from it,” Guthrie adds.

(Continued)

- Diagrammatic view of insulation on removable head of continuous filter maintaining temperatures as low as 70° below zero. Head is insulated with Armstrong's Corkboard, 8" thick, protected with sheet metal. Tank body insulated with 8" corkboard finished with Armstrong's Asphalt Emulsion. Removable flange sections are made up of 2 layers of Armstrong's Corkboard, each 3" thick. Each section is covered with sheet metal and bolted to wood rings.



Tank Head and Body Insulation

Removable Insulation Over Flanges

**We have
been asked . . .**

**"What's the best way to insulate
a removable tank head?"**

"I want to insulate the removable head of a low-temperature filter tank," writes a plant engineer. "How can this be done so that the tank head can be taken off during cleaning without damaging the insulation."

To help maintain correct internal temperatures, we advised that Armstrong's Corkboard in the proper thickness be applied to both the tank body and head in hot asphalt or adhesive, and banded in place. To make the insulation removable over the flanges, it should be fastened on mechanically instead of with an adhesive. As illustrated in the drawing above, curved segments of Armstrong's Cork-

board are built up and fitted around the flange. Each segment is covered with sheet metal for extra protection and easy removal. When they're bolted and banded on, the segments fit tightly, keeping heat away from the cold flanges and preventing condensation and frost damage.

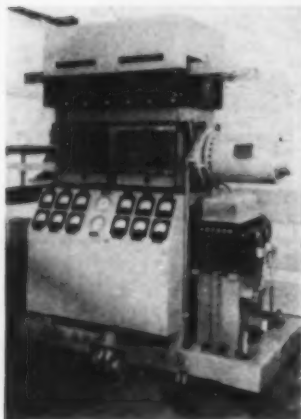


SEND US YOUR QUESTIONS: If you have any questions involving the use or application of low-temperature or heat insulation, do not hesitate to call on us. We'll see that you get a practical answer. Just address a letter or post card to Armstrong Cork Company, 3308 Concord Street, Lancaster, Pennsylvania.

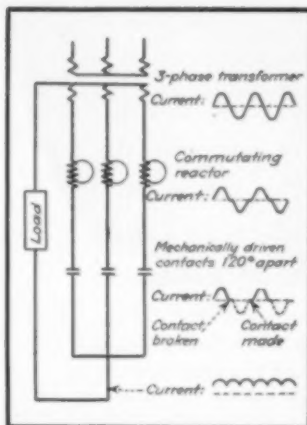
ARMSTRONG'S INDUSTRIAL INSULATIONS

MATERIALS - INSTALLATION

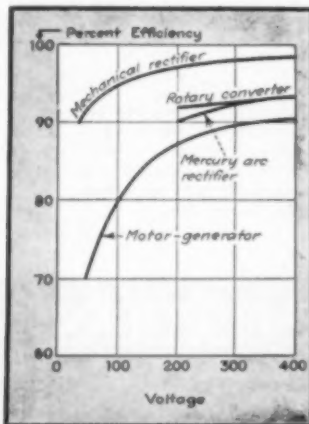
FOR ALL TEMPERATURES FROM 300°F. BELOW ZERO TO 2600°F.



IT'S COMPACT



IT'S EFFECTIVE



IT'S EFFICIENT

Revolution in Rectification

For the electrochemical industry, this new rectifier means higher conversion efficiency at low voltage. Hence fewer cells in series are needed and hook-ups can be simpler.

What looks like a trend in a.c. rectification is gathering momentum in the electrolytic industries. It's only two and a half years since the first two units of a new type of direct-current producer began operating at the Buffalo Electro-Chemical Co. In that short span, the new unit has gained acceptance and many will be installed in electrolytic plants. The equipment builder, I-T-E Circuit Breaker Co. of Philadelphia, just recently gave potential users a glimpse of what the new improved version of its mechanical rectifier can do. The occasion: official acceptance tests of a 12,000-amp., 65-volt unit to be installed this month in the new chlorine plant of Superior Gas & Equipment Co. near Manila; the plant is expected to free the Philippines from dependence on foreign chlorine.

In addition to the Buffalo units, a few others have already gone into operation, including two for Canadian Mesins & Chemical Corp. at Shawinigan Falls, and others for Bell Laboratories, U. S. Navy and U. S. Signal Corps, and for the Maintenance Co. in New York. Now, however, the company is building a near-flood of units, among them rectifiers for Hercules Powder Co., Pennsylvania Salt Mfg. Co., U. S. Metals Refining Co., Marathon Paper Mills of Canada, Imperial Chemical Industries, General Motors Corp. and Fields Point Mfg. Corp., plus five more for Buffalo Electro-Chemical. It is rumored that I-T-E's experience with the mechanical rectifiers has been so encouraging that other leading electrical equipment makers are rushing development work on designs of their own.

Compared with other rectifying devices such as motor generators, rotary converters, and the various mercury-arc types, the mechanical rectifier gives higher conversion efficiency in the range from 50 to 400 volts d.c., and requires only about 30 percent of the floor space. It is lighter, more mobile and easier to install and maintain. Early predictions of unreliability seem not to have been borne out.

Fundamentally, any rectifier is a switch which is synchronized with the alternations of the current supply so that it allows passage of current in one direction only. With a mechanical switch the trick is to break the circuit in each phase exactly at the point of zero current flow, so as not to burn

the contacts. How to do this was discovered in 1940 by the German Siemens-Schuckert organization which perfected the principle and made several large installations at I. G. Farben and other plants in Germany during the war years (*Chem. Eng.*, Dec. 1946, p. 264). Very briefly, the secret lay in passing the current in each phase through a commutating reactor which puts a short "step" of zero current between the alternations of the sine wave. This gives time for the synchronous-motor-driven mechanical switch contacts to open and close, without sparking or arcing, and with practically no voltage drop in the contacts.

Immediately after the war I-T-E took over the development in the United States, making a variety of improvements that have taken the equipment out of the experimental state. Electrolytic industries, in particular, are interested because for the first time it is possible to secure high conversion efficiency without going to high d.c. voltages. This means, in terms of electrolytic cell practice, that only about one-third to one-tenth as many cells need be hooked up in series to absorb the output voltage drop, which simplifies hook-up and adds materially to personnel safety.

Work Starts on Monsanto's Idaho Phosphorus Plant

Contracts for the design and construction of its multi-million dollar elemental phosphorus plant at Soda Springs, Idaho, have been awarded by Monsanto Chemical Co. to H. K. Ferguson Co. of Cleveland and Morrison-Knudsen Co. of Boise.

Ferguson will design parts of the processing plant, steam plant, water treatment plant and the office, laboratory, service and machine shop building. It will also handle the design of roads and railroads and drainage and sanitary facilities. Purchase of materials and equipment will also be handled by Ferguson.

Morrison-Knudsen, in addition to constructing the plant, will install process equipment. Construction gets under way this summer, with completion expected late in 1952.

The plant will be used for mining and processing operations and for con-

(Continued)



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Caustic Soda
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NIAGARA ALKALI COMPANY

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News, cont. . .

verting phosphate rock into elemental phosphorus. The decision to locate the project at Soda Springs came after a three-year investigation of mineral deposits, plant sites, power and transportation facilities in the Rocky Mountain area.

Thick San Ardo Crude Carried In Line Built of Old Pipe

General Petroleum Corp.'s new and unique San Ardo, Calif., pipeline is now in operation, and tankers are loading San Ardo crude at Estero Bay, Calif.

About 80 percent of the load taken aboard by the tankers will be crude oil, the rest a light cutter oil that is mixed with the heavy, sticky San Ardo crude to make it flow, which it will not do in an ordinary pipeline. Cutter oil is delivered to San Ardo

through a small pipeline paralleling the larger one.

The new General Petroleum line, built at a cost of over \$2 million, employs heat as well as the cutter oil to make the oil flow. The mixture of cutter oil and crude is heated as high as 175 deg. F. as it is pumped along the 40-mi. pipeline to the sea.

The line makes full exploitation of the estimated 50 million to 100 million barrels of crude oil lying beneath the San Ardo field economical for the first time. It is currently delivering about 8,000 bbl. daily of the mixture of cutter oil and crude to the Estero Bay terminal. At full capacity, the line could handle many times this amount.

At present, the San Ardo field is producing 2,800 bbl. daily. Companies producing in the field (which do not include General Petroleum) are getting ready to do more drilling to increase the field's output.

Materials for the pipeline, both pipe and pumping installations, were obtained by dismantling a 38-year-old idle pipeline in the Mojave Desert. Over 98 percent of the old pipe was re-usable as a result of special reclamation techniques worked out for the project. The reclamation saved over 2,500 tons of scarce pipe and many thousands of dollars.

More Ammonia and Methanol Capacity for CSC in Dixie

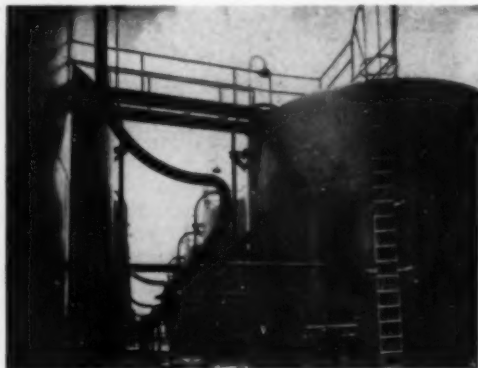
Commercial Solvents Corp. will double capacity for production of both anhydrous ammonia and methanol at its Sterlington, La., plant. It will also install facilities for ammonium nitrate.

This expansion will cost \$20,458,000. Commercial Solvents gets fast amortization at 50 percent of the estimated cost of the new facilities. Completion is slated for January 1953.

(Continued)



NEW PLANT: Soap and detergent building flanks central office and laboratory on left, shortening building on right.



TANK FARM of dozen huge tanks stores fats and oils used in soap, detergent and shortening made at Lever's new plant.

Lever Goes West

To beat freight costs and cash in on the rich West Coast market, Lever Brothers Co. has put up a big new plant eight miles east of Los Angeles. Most modern of its kind in the world, it is producing soap, detergents and edible products for the 11 Western States, formerly supplied by Lever's plants in the East and Midwest.

The plant occupies one-third of the 30-acre site. It has six major buildings: two finishing units joined by an office and laboratory building; two processing units; and a steam-generating plant. Much processing equipment is outdoors, with some automatic equipment completely in the open.

Smoke and odors are eliminated, and water conservation equipment is employed. Initially, the plant will operate at the rate of 33,450 tons of finished products per year; later it will turn out 135,000 tons annually. Biggest investment ever by industry in Los Angeles County, the plant makes Los Angeles a top U. S. soap center.



SOAP KETTLES: New Los Angeles plant has 10 of these big kettles, each turning out about 170,000 lb. of soap per boil.

Did you know?...



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Isopropyl Ether
Diisobutylene
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News, cont. . .

U. S. Rubber to Double Output of Baton Rouge Plant

Production of its Baton Rouge, La., synthetic rubber plant will be doubled by the Naugatuck Chemical Division of United States Rubber Co. New reactors, drying units and other production equipment, as well as latex storage facilities and warehouses, will be added. The expansion will be completed by early 1952.

It will bring plant capacity for the production of Paracril nitrile rubber, Nitrex latex, high-styrene latex and high-styrene resins to approximately 30 million pounds annually. Cost of the expansion: about \$2 million.

Naugatuck purchased the plant late in 1950 from Esso Standard Oil Co. It's one of the oldest synthetic rubber plants in existence. The first batch of GRS produced in the United States was made at this plant in December 1941, under a cooperative program by technicians of Esso and U. S. Rubber.

Paracril rubber is used in self-sealing fuel cells and bullet-sealing hose for military aircraft and for critically needed oil-resistant rubber products. High-styrene latex goes into water-based paints and paper coatings. High-styrene resins in combination with Paracril are used for injection molding and extruding. Nitrex is Paracril in latex form for use in paper, textile and leather finishes.

New Byproduct Ovens Make Wheeling Self-Sufficient

A battery of 63 byproduct coke ovens now being constructed at East Steubenville, W. Va., at a cost of about \$9 million will give Wheeling Steel Corp. a total of 314 byproduct ovens.

These ovens will make Wheeling self-sufficient, as far as coke is concerned, resulting in a substantial cost reduction based on capacity output of steel and steel products. By 1953, Wheeling's annual capacity for coke will be increased by 365,000 net tons to 1,661,000 tons.

Installation of these coke ovens is part of a postwar expansion that will cost more than \$100 million when completed. A new construction and improvement program, now under way, will boost steel capacity at a cost of \$24 million. And since 1946 Wheeling has invested more than \$70 million. For each of Wheeling's 16,000 employees, more than \$6,400 will have been spent on capital improvements in the period 1946-1953 to increase production, lower costs and improve working conditions.

Pipeline of Phillips Petroleum Co. between Borger, Tex., and East Chicago, Ind., will soon be able to handle an added 30,000 bbl. per day. Work has started on the laying of 500 mi. of additional pipe. This will ease the shortage of liquefied petroleum gas in the Chicago area. Underground storage facilities near Borger, Kansas City and Chicago will store surplus in the summer against winter demand.

More sulphonates are coming from the Martinez, Calif., refinery of Shell Oil Co., where additional facilities for their manufacture are now on stream. Big use for these oil-soluble sodium sulphonates is in heavy-duty lubricating oils.

Financing: Speer Carbon Co. will raise \$10 million through note borrowing and common stock sales. Part of the money will be used to build a new plant for International Graphite Co., a subsidiary, at Niagara Falls. Increased demand for electrodes is behind the move.

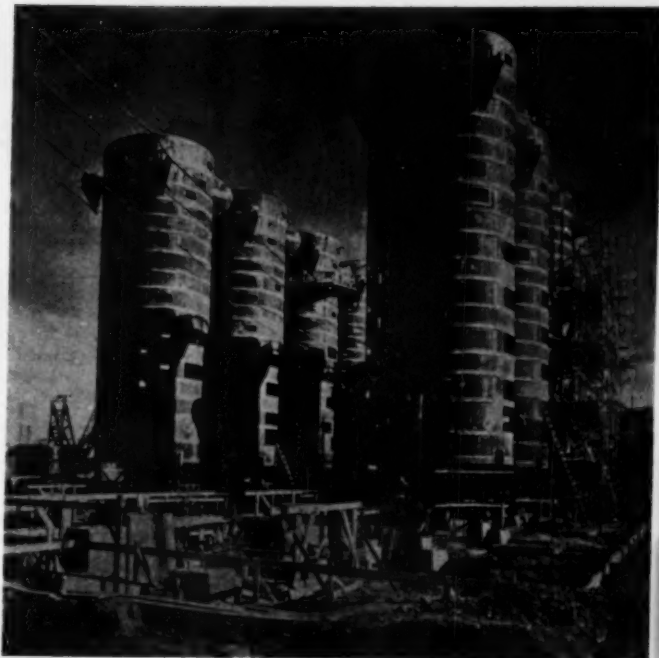
Kraft mill at Everett, Wash., to cost \$19 million, will be built by Weyerhaeuser Timber Co. Daily capacity: 250 tons. It will utilize waste from the company's Everett sawmill, now sold as "hogged fuel" and sawdust. The plant will employ 300.

Push-button plant: At a cost of more than \$250,000 Naco Fertilizer Co. has modernized its Fort Pierce, Fla., plant, making it a push-button operation. Besides the fertilizer plant, now in full production, Naco will have a complete insecticide unit.

Schoch process for making acetylene and other chemicals from natural gas, related petroleum products and other gases by use of an electric discharge will be further explored at the University of Texas in Austin. Dow Chemical Co. has granted the university \$10,000 to make this possible. The Dow grant will be used, according to Dr. E. P. Schoch, who developed the process, to investigate production of other chemicals by the electric discharge method.

Converting plant, to cost \$3 million, will be built by Crown Willamette Division of Crown Zellerbach Corp. at San Leandro, Calif. It will convert about 25,000 tons a year of paper into toweling, tissue wrappers for fruit and grocery bags. Jumbo rolls will be brought from Crown plants in the Pacific Northwest.

—End



10% of the world's nickel to come from one plant

Nickel Processing Corporation* is now arranging to place again in operation one of the world's important nickel plants, at Nicaro, Oriente, Cuba.

The twelve largest Nichols Multiple Hearth Furnaces ever constructed are installed at Nicaro. Production will amount to approximately 10% of the world's nickel supply.

The above is typical of the engineering service and equipment supplied by Nichols.

Consult us regarding roasting, calcining, drying and thermal processing applications.

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1477 Sherbrooke St. W., Montreal 25, Canada

Readers' Views & Comments

Penicillin Superlatives

Sir:

I am a regular reader of your publication, which I like very much. Recently I read with great interest the article about the subject of labor, steam and water requirements to make a ton of chemical by certain processes.

If it is possible, I would like to kindly request the same information for a penicillin plant...

WALDEMAR C. MENEZES

Rio de Janeiro
Brazil, S. A.

One ton of penicillin requires approximately 234,000,000 gal. of water, 66,000,000 lb. of steam and 2,380,000 kwh. of electricity.

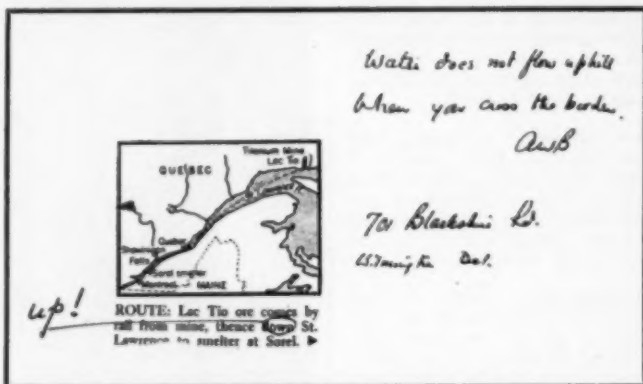
The proper way to report penicillin figures, of course, is in terms of Oxford Units (O.U.). These then become 155 gal. of water, 43.5 lb. of steam and 1.6 kwh. of electricity per 1,000,000 O.U. of penicillin.—Ed.

A, B or C?

Sir:

What is the cost of a synthetic vitamin A plant?

In your description of Pfizer's plant... the caption beneath the picture



POSTCARD COMMENT: Ore now goes upstream down to Sorel.

gave the cost as \$70 million. The article that followed reduced the figure to \$7 million.

In the description of the process for manufacturing vitamin A (May, p. 219) the value of the plant was listed at \$2 million.

MOE JOHNSON

Chemical Supervisor
Richmond Hill 18, N. Y.

We've checked with our friends at Pfizer—whose plant was described—and

they tell us the correct figure is \$2 million.—Ed.

Add \$13.50

Sir:

It has come to our notice that your February issue listed our report "Underground Coal Gasification in Post-war Europe" as selling for \$1.50 per copy. The actual price is \$15 per copy. . . .

DR MAX LEKUS

President
Accurate Translation Service, Inc.
711 Woodward Bldg.
Washington 5, D. C.

LITTLE BONERS



A Tremendous Trifle

Sir:

An enterprising company planned to build a huge chemical plant in Texas. The company's design engineers—among the best in the country—got to work. They would make that plant the pride of all Texas.

When the time came to specify materials of construction for the equipment in one processing unit, there were some arguments. Wood was

probably the best—and certainly the cheapest—material for this very corrosive chemical. Yet the equipment had to be unusually large and complicated for wooden construction.

Wouldn't it be better to play safe and use the expensive metal instead of wood? No, argued the design engineers. For, by the Alamo, they were determined to show what could be done with wood.

They did. The finished job was probably the biggest and fanciest and toughest design job in wood ever seen in a chemical plant.

"There'll be no corrosion problem here," boasted one engineer, "not a piece of metal in the place."

But after a few weeks of operations, that fancy wooden equipment began to fall apart—literally.

Ordinary nails had been used in just the wrong places!

This "little boner" may be hard to believe. Yet it was told to us by one of the company's engineers who was there. Why not send in your own favorite "little boner"? Address the Editor, Chemical Engineering, 320 West 42nd St., New York 18, N. Y.

Data on Dry Ice

Sir:

I have noted with interest your graphical presentation of process manpower requirements on p. 151 of the February issue of Chemical Engineering.

The chart gives eight man-hours per ton for dry ice from flue gas . . . (which) would be at least \$12 per ton today. This appears to me to be rather high. For plants from 25 to 100 tons I would expect a distinctly lower figure.

I would appreciate your comments.

WM. L. GLOWACKI

Research Dept.
Eastern Gas & Fuel Associates
Boston 16, Mass.

Eight man-hours per ton is for a dry ice plant using potassium hydrate as scrubbing agent. For a modern plant using amine scrubbing and producing 30-50 tons a day, labor requirement is about six man-
(Continued)

WOLVERINE COPPER TUBING *first* ON D.O.

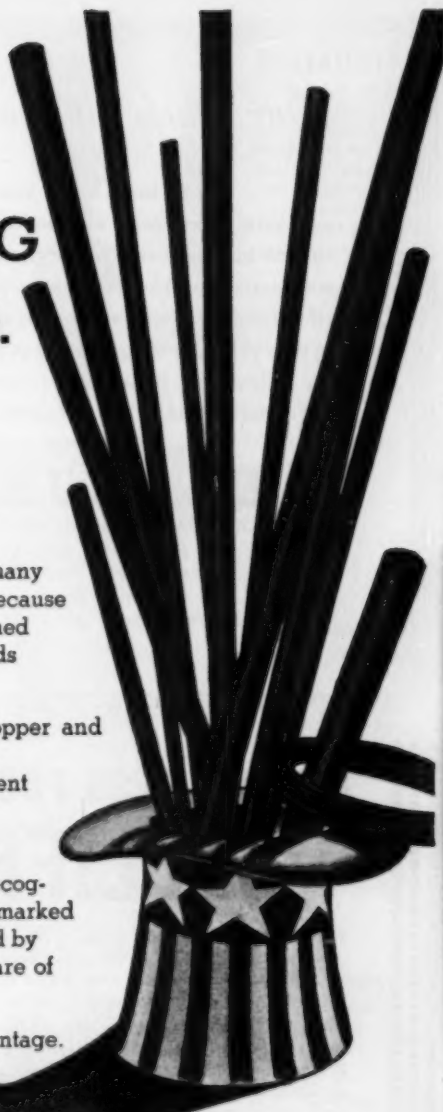
but we're not forgetting YOU

Copper and copper base alloy tubing is specified on many Defense Orders. Wolverine tubing is often selected because it is, as you know, quality-controlled from ore to finished product and, therefore, conforms to the high standards that must be met.

Incidentally, Wolverine has been manufacturing copper and copper base alloy tubing for well over thirty years—for domestic production and in answer to government needs when required.

But like all other manufacturers, we are cognizant of the division of our obligations. Your needs, too, are recognized. Not all the copper tube we produce daily is earmarked for emergency use. The maximum percentage allowed by government regulations is being produced to take care of essential domestic needs—your other needs.

Whatever tube you can get, utilize it to the best advantage. Employ it judiciously and we shall all get along very well until the emergency is over.



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THE heads of our various groups may have worked with our kind of chemicals all their business lives. Yet they are as eager as youngsters in seeking better ways to make our chemicals, for new derivatives and an extension of their uses. Our organization is at your service for information pertaining to our products. All inquiries held in strictest confidence.

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READERS' VIEWS, cont. . .

hours per ton of dry ice. This is because the amine process increases the yield of CO₂ per ton of coke.

For plants with a capacity of 100 tons a day, the labor would be well under six man-hours—possibly down to four.—Ed.

Who's Interested

Sir:

May I offer consolation to the female chemical engineer who asks if there is a real shortage of engineers. I am asking the same question, is there a real shortage?

I graduated in June 1950 and for various reasons did not get a job as a chemical engineer. Now that there is a shortage I still cannot get an engineering job because when I am asked about my military status I have to say that I am a reservist, inactive at that. R.V.B.

Chemical Engineer
Elmhurst, Ill.

On request from any prospective employer, we'll gladly send job-hunting R.V.B.'s name and address.—Ed.

Benzaldehyde

Sir:

In the article entitled "What Price Process Plants?" in the May issue of *Chemical Engineering*, the investment required for benzaldehyde via chlorination is given as \$960 per annual ton of capacity and also as \$96 . . . Which is correct?

Incidentally, I find your new series of cost articles most informative and useful.

GORDON KIDDOO

Asst. Director
Petrochemicals Dept.
National Research Corp.
Cambridge 42, Mass.

Correct figure is \$960 for a rather small plant, probably \$550-650 for a very large unit.—Ed.

P.Q. Comes Thru

Sir:

I enjoy your "Little Boners" and believe there should be more admission of mistakes for future guidance and less boasting of how smart we are.

You may be interested in using the attached incident which happened while I was plant engineer with the X company. Don't use my names.

NAME WITHHELD

P. Q., Canada

Our Canadian friend has supplied next month's "Little Boner." Can you report any you've seen?—Ed.

—End

COMPARE

THIS FEATURE

OF THE HONEYWELL

SERIES "700"

VALVE

* Compare the Versatility of this valve with that of any other wide band proportional type . . . for instance, the easy reversibility of the plugs in the field.

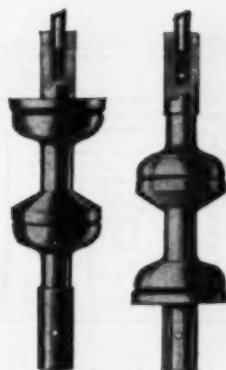
Then check the other features of the valve . . . the Specially Designed Diaphragm, the Duplex Stem Guide, the One-Piece Bonnet, the Packless Bellows Seal, the Safety Stem Lubricator, the wide variety of discs to meet the most exacting process requirements.

Your comparison will prove that the Honeywell Series 700 has all of the features you look for in a fine valve.

It's available in a wide range of styles and sizes. For detailed information, write for a copy of Bulletin 700-2 or call in your local Honeywell engineer . . . he is as near as your phone.

MINNEAPOLIS-HONEYWELL REGULATOR CO., Industrial Division, 1904 Windrim Ave., Philadelphia 44, Pa. Offices in more than 80 principal cities of the United States, Canada and throughout the world.

New Bulletin 750,
"Control Valve Sizing Data"
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VERSATILITY

Design of plugs and bodies permits easy reversing in field. Simply invert body and plug and reattach. No extra parts or complicated adjustments required. Valve travel indicator plate is etched on both sides and need only be turned over when inner valve action is reversed.



Specially Designed
Neoprene Diaphragm

Duplex Upper
Stem Guide

Packless
Bellows Seal

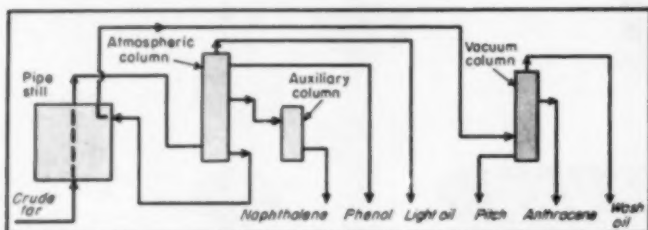
Safety Stem
Lubricator

One-Piece
Bonnet

Wide Variety
of Discs

Honeywell

VALVE PRODUCTS



First Double-Flash Tar Distillation Units

Up yield and quality of product, cut down on processing time and heat consumption.

Tar distillation by a double-flash method, employing atmospheric pressure in the first stage and then vacuum, has been developed jointly by Koppers of Essen and the Gesellschaft fuer Teerverwertung.

The new method gives a 5 percent increase in oil yield over the old pot still distillation system. And, it operates with considerably lower heat consumption.

First to operate under the new system was the recently rehabilitated Carolinenglueck plant of Gelsenkirchener Bergwerke AG in the Ruhr. But a similar Koppers-engineered plant has since gone into production in Holland and one is in construction in Britain.

The crude tar is heated to a temperature of 330 deg. C. in a regular pipe still under pressure. The boiling point is low enough to accomplish the distillation of the light products in the atmospheric column. These are light oil, carbolic oil and naphthalene.

Residue from the first column, composed of wash oil, anthracene oil and pitch, after heat exchange, is reheated in the pipe still and enters the vacuum column. From the vacuum column, wash oil goes overhead, anthracene sidestream and pitch below. The "double-flash" in the process name is a result of the two flash chambers used in series to fractionate the tar constituents—the first in the atmospheric column, the second in the vacuum column.

Anthracene oil is notably difficult to distill under atmospheric pressure. By using vacuum, there is a quicker and better crystallization. Because of

the better quality, it is possible to use centrifuge for separating in place of the old filter presses. Water-cooled agitating coolers are employed. And, in this connection, it is important to note that a water jacket is only possible with oil from the vacuum distillation. The anthracene residue has an oil content of only 2 percent.

The new system uses about 240 cal-

ories per kilo of crude tar as against 600 calories under the old method. Lower temperatures also aid in combating corrosion, which heretofore became a problem over 340 deg. C. temperature. Temperature is 330 deg. C. in the atmospheric column and 320 deg. C. in the vacuum column.

Carolinenglueck's output shows variations due to the plant's drawing upon seven different cokeries. An average production shows: 1 percent light oil, 3.5 percent carbolic oil, 11 percent naphthalene, 10 percent wash oil, 24 percent fuel oil, 3 percent anthracene and 47.5 percent pitch.

Carolinenglueck has a 250 ton a day capacity, whereas the Beckton, England, plant's is 400 and that of the Tebu plant at Uithorn, Holland, is 150. Another plant is scheduled to be built in Germany next year.

Tar distillation under vacuum was developed during the war. The first installation, a single flash plant, was built by Gesellschaft fuer Teerverwertung at Duisburg-Meiderich, in 1942. Following the war, GFT teamed up with Koppers, which in 1935 had introduced the principle of continuous distillation of tar under atmospheric pressure.

British Refinery Speed-Up

Faced with the loss of the world's largest oil refinery at Abadan, Iran, the British government is about to announce emergency speed-up measures in the construction of new refinery capacity at home.

Most favored project will be Standard Oil of New Jersey's Fawley refinery at Southampton. Scheduled to start production in early 1952, the \$100-million refinery may now begin working this month. The government has cleared the decks for special priorities on scarce materials to enable Esso Petroleum Co. (Standard's local subsidiary) to finish the job at breakneck speed.

Fawley will produce 5.5 million tons in its first year. That's between a third and a half of Britain's annual requirements.

All told, Britain's oil industry has nearly \$350 million currently invested in expansion schemes. Shell Petroleum Co. Ltd.'s new refinery at Stan-



Cat cracker at Fawley refinery which begins operations this month.

low, Cheshire, is scheduled to be in full operation early next year. Installation of a new distillation unit last month upped the output at Stanlow to 3 million tons a year. Target output is 4.5 million tons.

(Continued)



Chemical Progress

News of developments from General Electric's Chemical Division that can be important to your business.



This picture shows how a corrosive poured on a metal section coated with R-108 (to right) doesn't affect the surface! Untreated section (to left) is badly scarred. Tests also show that R-108 imparts unusual toughness, adhesion and heat resistance to metal finishes.

You can obtain a complete technical report on R-108 by writing to: Chemical Division, General Electric Company, Pittsfield 14, Mass.

SAVE SCARCE METALS WITH NEW G-E COATING INTERMEDIATE

Here's a new and versatile product of General Electric's program of chemical research. It's R-108, a coating intermediate that provides exceptional resistance properties to industrial finishes.

Finishes formulated with R-108 are highly resistant to chemical corrosives. Their use extends the life of steel shipping containers like tank cars and drums. Ordinary steel chemical processing and manufacturing equipment, coated with finishes containing R-108, can often be substituted for expensive and hard-to-get alloys.

Coatings made with R-108 are mar-resistant, adhere well to metals, glass, wood and plastics, and fit in easily with standard techniques for applying and baking.



G-E PLASTICS FOR DEFENSE

General Electric chemical products are already being used in many important defense applications. Among the numerous products and services offered are new, expanded molding facilities which enable G.E. to mass-produce low-cost plastics parts quickly and efficiently. Injection machines range in size from 1½ to 208 ounces; compression and transfer equipment, from 3 to 36 inches. G-E chemical plants are located at Pittsfield, Mass.; Schenectady, N. Y.; Waterford, N. Y.; Coshocton, Ohio; Decatur, Ill.; Taunton, Mass.; and Anaheim, Cal.

PLASTICS COMPOUNDS • SILICONES • INSULATING MATERIALS • GLYPTAL® ALKYD RESINS • PLASTICS LAMINATING, MOLDING, AND EXTRUDING

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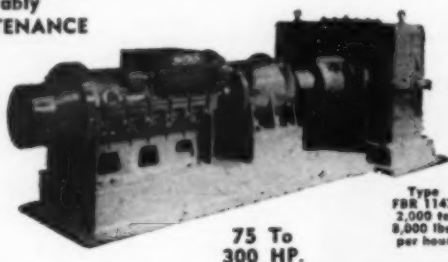
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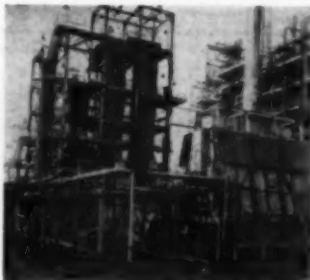
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FOREIGN NEWS, cont. . .

If everything goes according to plan, Britain will be able to meet all its needs from refineries at home by 1954. Then production is expected to hit 23 million tons. Next year home refineries should be turning out 17 million tons.



POLYMERIZATION, one of . . .

Five Steps to Ethylene

Five principal process steps make up the unique ethylene production plant now under construction by M. W. Kellogg for ICI at Wilton, England. First of its kind in the world, the plant will produce, primarily, large quantities of very pure ethylene for the company's chemical manufacturing operations. It will also turn out smaller quantities of motor gasoline and propylene. The propylene will be further processed into isopropyl alcohol and its derivatives.

In the first step of the process, naphtha is charged to oil heaters. In step No. 2 it goes on to the pyrolysis section. Pyrolysis occurs in an insulated transfer line as superheated steam is introduced to raise the temperature of the oil to approximately 1,700 deg. F. During this step the ethylene is produced by cracking paraffinic material in the naphtha.

This mixture of hydrocarbons is then split into gasoline and lighter fractions in the primary fractionator (step No. 3). The gasoline fraction is debutanized and then is treated with phosphoric acid to polymerize entrained diolefins into polymer gasoline (No. 4).

Gases from the primary fractionator, after removal of hydrogen sulphide, pass through a special process step in which all moisture is removed to preclude icing during the later low temperature fractionation operation. After leaving the dryers, the vapors pass through catalytic acetylene-conversion step which converts virtually all of this

gas into ethylene. The mixture of gases is then piped to the recovery section (step No. 5) where the pure ethylene is separated from the other constituents.

Reported This Month

MEXICO

Polystyrene in sufficient quantities for the country's growing plastics industry will be produced at the newly-opened plant of Monsanto Mexicana S.A., first Latin-American branch of Monsanto Chemical Co.

Corning Glass Co. is about to begin construction of a \$2 million plant at Monterrey. The company has acquired an interest in the Mexican firm, Cristales Mexicanos and has formed Corning Mexicana, S.A.

Caustic soda and soda ash plant is planned for the coast of the Yucatan. Daily capacity: 50 m.t. Part of the raw materials will come from sea water.

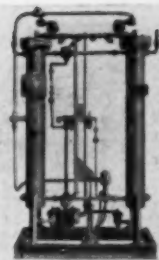
CANADA

Isopropyl alcohol and acetone will be turned out at a \$3 million plant to be built by Shell Oil Co. of Canada in Montreal East. Operations will begin late next year at a rate of 20 million pounds yearly. Both products will be marketed in Canada.

The new plant will adjoin the company's refinery which has just undergone a two-year expansion program. It boasts a new compact catalytic cracking unit which utilizes an unusual catalyst to produce higher octane gasoline. Liquefied petroleum gases previously burned as fuel are now recovered. There is an in-line blending plant, unique in Canada; new topping, polymerization and vacuum flashing units.

An "oil masterbatch", a new process for producing synthetic rubber, has been developed by the Canadian government's Polymer Corp. It is expected to increase production of general purpose rubber by 20 to 25 percent without increasing butadiene and styrene consumption. Product quality is said to be at least as good as ordinary synthetic rubber and large scale production plans are afoot.

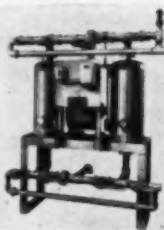
Acetone and phenol will be produced by a new company, B.A. Shawini-
(Continued)



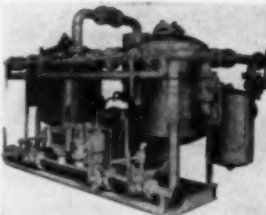
This Kemp Oiled Dryer is controlled by program timer. All operations, including tower reversal, fully automatic. Rated: 100 scfm, 100 psig, 70° F.



This Semi-automatic Kemp Oiled Dryer dries air for actuating tools, valves, etc.—dries process air and gases. Rated: 600 scfm, 100 psig, 70° F.



This Kemp Radiation-Cooled Dryer gives maximum efficiency with minimum maintenance and operating costs. Heating period terminates automatically. Rated: 300 scfm, 100 psig, 70° F.



This electrically activated Kemp Dryer is designed to gas stream is not contaminated by air normally used for reactivation. Rated: 3200 scfm, 100 psig, 70° F.

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Kemp Dynamic Dryers dry Air, CO₂, Ammonia, Gasoline, Nitrogen, Propane to low dew points for as little as 1/4¢ per mcf

If you think drying air, gases or liquids costs too much—find out how Kemp can save you money! Hundreds of Kemp Dynamic Dryers control moisture at low cost in plants all over the country. Operation is guaranteed to your specifications and the cost is surprisingly low. Many Kemp users report drying to sub-zero dew points for as little as 1/4¢ per mcf—including all charges for labor, capital investment and materials!

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Kemp Dynamic Dryers are versatile—offer manual, semi-automatic or automatic operation. Desiccant is especially selected and compounded for the type drying your problem calls for. With Kemp you can dry air, gases, or liquids, control humidity in large or small areas, or eliminate moisture in materials. Gas, electric or steam regeneration is supplied as standard equipment.

Send for Information

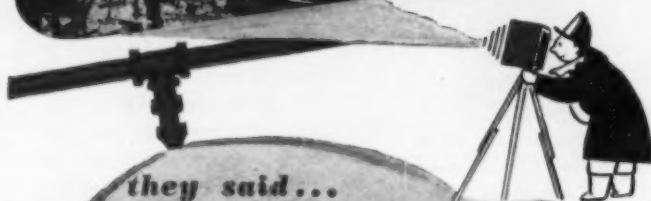
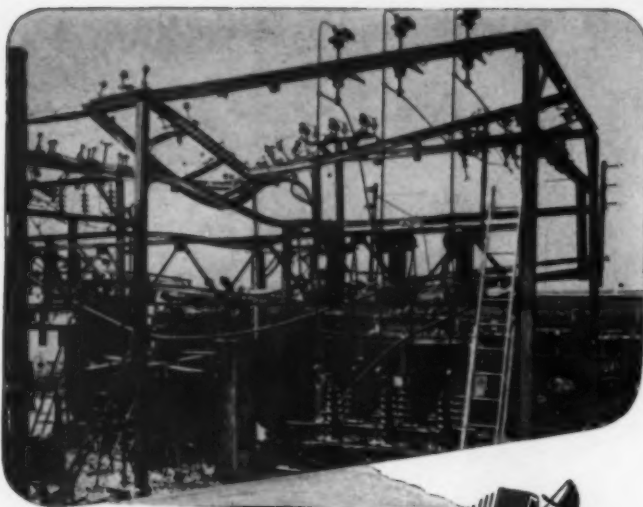
Whether your moisture control problem is standard or special, you'll find Kemp has a Dynamic Dryer especially designed to solve it. Find out how Kemp engineering can be put to work for you to solve your problem . . . save you money. Write today and tell us your requirements. There's no obligation.

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they said...

"it can't happen HERE!"

That's right. Some well-intentioned individuals had it figured out that the hazard of fire at transformer sub-stations or industrial power generating units needed no particular study. So, as evidence, we offer the photograph above—proof of the fact that electrical equipment fires not only can, but do happen, and—with serious consequences.

Although damage to this transformer bank and supporting structural members was severe, the unseen loss of man-hours, out-of-service time and other factors, actually represents the major damage. They're losses, too, that seldom show up in fire reports.

In these days of our nation's need for maximum defense effort, you cannot afford to be without positive fire safety at all times. **Automatic FIRE-FOG** would have extinguished this electrical blaze instantly. Other systems of *Automatic Sprinkler* protection are available for the safeguard of any classification of commercial, industrial, or institutional property.

You can't overextend your practice of fire safety, for to anticipate fire is to avoid its ravages.

Stop fire at its origin with *Automatic Sprinkler* protection.

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FIRST IN FIRE PROTECTION

DEVELOPMENT • ENGINEERING MANUFACTURE • INSTALLATION
OFFICES IN PRINCIPAL CITIES OF NORTH AND SOUTH AMERICA

FOREIGN NEWS, cont. . .

gan Ltd., in Montreal East, Que. To cost several millions, the project is a joint venture of the British American Oil Co. and Shawinigan Chemical Ltd. Its operations will be linked to British American's oil refinery recently opened in Montreal East.

The process to be used: alkylation of benzene with propylene to get cumene; oxidizing cumene with air to cumene hydroperoxide; converting hydroperoxide to a mixture of acetone and phenol by a disproportionation reaction.

VENEZUELA

Celanese Venezolana, organized principally by the Celanese Corp. of America in cooperation with Venezuelan textile interests, will operate the first rayon plant in the country. The company may enter production of viscose yarn and staple if local demand justifies. Production of industrial chemicals from petroleum, similar to those produced by Celanese in Texas, is foreseen.

ITALY

Whole range of petroleum products, to be marketed in Italy and Central Europe, will come from Condor's 1.3 million-ton refinery at Rho, near Milan. Scheduled for full operation by the end of 1952, the plant's units include: an atmospheric distillation plant with a working through-put of 30,000 bbl. of crude daily; catalytic cracking plant, 15,000 daily; recovery, separation and purification plants for liquid and permanent gases.

Ethylene and propylene, 10,000 m.t. a year apiece, will be the principal products of Montecatini's plant under construction in Ferrara for which ECA has just allotted \$2.7 million. End products will include acetone, butadiene, styrene monomer, polyethylene.

AUSTRIA

Sulphuric acid plant at Gailitz, Carinthia, will shortly go into production on an experimental scale. Set up by the Bleiberg Gerwerksunion, it will utilize sulphurous ore. Initial capacity is 15,000 tons annually, to be raised to 30,000 tons by the summer of 1952.

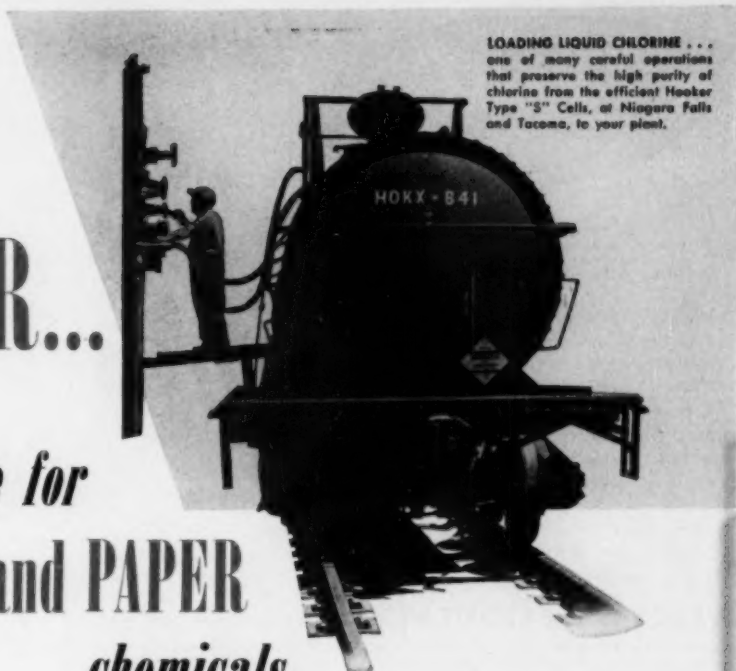
Work on a second sulphuric acid plant, to be established by the Austrian Nitrogen Works at Linz, will

(Continued)

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one of many careful operations
that preserve the high purity of
chlorine from the efficient Hooker
Type "S" Cells, at Niagara Falls
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Production of Hooker Chemicals is at an all-time peak, and facilities are being expanded to meet new demands as promptly as possible. For up-to-date delivery information, please keep in touch with your Hooker sales representative.

- Caustic Soda
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of Hooker Chemicals, send for Bulletin 100, which describes properties, typical uses, and shipping containers. Please write on your business letterhead.

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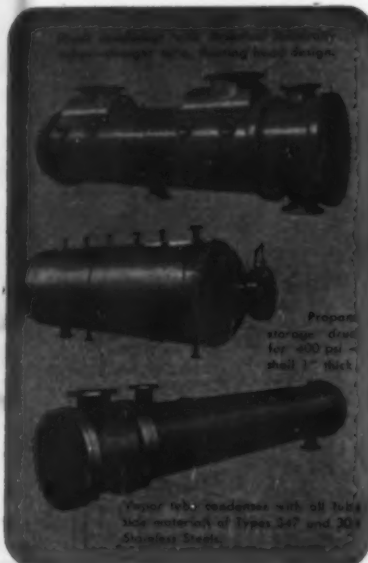


In style, performance and price, this pH Meter is the most progressive that even Marconi's have designed. It is exactly right for the many applications which require something less than laboratory accuracy. It is right too, for the smaller plant or, as an inspection tool, for the large user. Covering 1 to 11 pH, it discriminates to 0.05 and is direct reading, self-contained and portable. The glass electrode is cleverly protected and the instrument, Type TF 889, may be either line or battery operated.

*An informative treatise
"Hydrogen Ions"
is available on request*

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FOREIGN NEWS, cont. . .

also start in the near future. This plant is to produce 40,000 tons of sulphuric acid annually from base material obtained from a local gypsum deposit.

Its output will be used mainly to meet the rapidly increasing sulphuric acid needs of the Nitrogen Works, which are planning to initiate the production of superphosphate. Once superphosphate production starts, Austria's total requirements of sulphuric acid will exceed 100,000 tons annually, so that she will still have to import 30 percent of her needs even after both sulphuric acid plants are in production.

New chemical products now being made by Donau-Chemie A.G. of Vienna include L54, a low boiling solvent for fats, oils, waxes, pitch, rubber and polychloride. Its pleasant smell makes it usable in extraction processes in the foodstuffs industry.

Perchloroethylene and tetrachloride of carbon is also being produced by a patented process. Plant byproducts are being used in the manufacture of an extremely active pickling medium which prepares surfaces for painting or varnishing.

BRAZIL

Chilean nitrate and Alsation potash go into the production of a mixture of assimilable nitrogen, anhydrous phosphorous, and potassium at a new million dollar plant at the port of Santos. Initial annual capacity is 30,000 m.t. of prepared fertilizer. The company, Potassa e Adubos Quimicos do Brazil S.A. is receiving cooperation from the Societe des Potasses d'Alsace.

INDIA

Reichhold Chemicals are planning a production unit in India for the large-scale manufacture of synthetic resins.

Lagging caustic soda industry has received a boost from the government with the raising of the selling price level by one third (now about \$7 per cwt.). The six firms producing this chemical make only 11,000 to 15,000 tons annually against the country's 50,000 tons consumption. Tata Chemicals and Alkali Chemicals plant has a capacity of 8,000 tons but current production is only 2,500. Now the government's price rise has removed one of three fac-

tors blocking the industry's expansion. The other two: lack of domestic demand for byproduct chlorine; high cost of imported soda ash.

NETHERLANDS

New oxygen plant in Rotterdam of N.V. Electro Zuur-en-Waterstof-fabriek will also make solvents. The company's plant in Eygelshoven has been closed down because of an agreement with the State Mines in Limburg to take the latter's surplus oxygen.

AUSTRALIA

Polyvinyl chloride production will be upped from 1,000 to 6,000 tons a year by Imperial Chemical Industries of Australia and New Zealand. The expansion program will take three years and \$6.8 million. Simultaneously the company is planning to push production of sodium hydroxide to obtain chlorine for synthesis of the plastic.

A 15,000-ton-a-year pulp and paper mill is planned by Associated Pulp & Paper Mills Ltd., to be in operation by 1954. It is reported that a very new continuous pulping process capable of treating both hard and soft woods will be used. Site is in the vicinity of Geelong.

BELGIAN CONGO

Utilization of papyrus in the production of cellulose is the aim of the new African Cellulose Syndicate. Research indicates that a highly refined cellulose pulp, usable in the manufacture of artificial silk, can be obtained from papyrus. It grows extensively in the Congo, especially in the Katanga area to which the Syndicate has obtained an initial concession.

Papyrus also contains pentosans which yields furfural, basic nylon chemical. And tests have shown that it can replace wood in paper manufacture.

Flow of copper, cobalt, tin, palm oil and manganese to the U.S. and Western Europe from the Congo will be substantially increased by a \$15.5 million Marshall Plan loan just granted. Belgium is supplementing the equivalent of \$60 million; private capital is investing an estimated \$60 to \$80 million this year. Already a principal supplier of these strategic materials, the area's impressive resources will be further tapped by both transportation and production improvements. —End

FOSTER FLOW TUBE*

(Gentile Patents)

Easy to Install...



As Easy as an Ordinary Pipe Fitting!

Take a good look at the picture of the Foster Flow Tube. Note how short it is in relation to the throat diameter—how a 12 inch Flow Tube is hardly more than 18 inches long. This is about maximum ratio for 3" sizes and larger. In high main line velocities (above 10'/sec. for liquids), tubes are less than one diameter in length.

Supposing you have a line carrying liquids or gases coming into your plant and you want to meter the flow accurately. Wouldn't you want to avoid an expensive installation, one that possibly involves a housing or vault for a meter that has to be installed outdoors? That's where the compactness of the Foster Flow Tube will come in handy. You can install it anywhere on the entering line—most of them can be indoors. You install it just as you would a short section of pipe—and as easily. Except to connect valves or regulators, upstream or downstream, you don't even need straight sections.

Coupled with this simplicity of installation is an accuracy comparable in all cases to that of the conventional primary devices; in many cases, a greater accuracy. Foster Flow Tubes are available in all commercial pipe sizes. Write for details and tell us about your processing and installation requirements.

*A Proved Flow Tube Added to Foster Line of Regulating Valves

FOSTER ENGINEERING Company

835 Lehigh Avenue • Union, N. J.

PRESSURE REGULATORS...RELIEF AND BACK PRESSURE VALVES...CUSHION CHECK VALVES...ALTITUDE VALVES...FAN ENGINE REGULATORS...PUMP GOVERNORS...TEMPERATURE REGULATORS...PISTON AND LEVER BALANCE VALVES...NON-RETURN VALVES...VACUUM REGULATORS OR BREAKERS...STRAIGHTENERS...SHOCK...SAFETY VALVES...FLOW TUBES

Materials of Construction vs. Phenol

Nickel and Nickel Alloys

W. Z. FRIEND, International Nickel Co., New York, N. Y.

Nickel and nickel-clad steel commonly are used for the storage, handling, distillation and condensation of high purity phenol where it is desired to maintain maximum purity of product and freedom from discoloration. The matter of freedom from discoloration and metallic pick-up are of particular importance in the storage and shipment of pure phenol because of the length of exposure involved. For this reason nickel has become established as a standard material for construction of storage tanks, tank cars and pipelines handling this product.

In one plant where pure phenol is stored over periods averaging 24 days in an 8,000-gal. nickel storage tank, chemical analyses of phenol samples from the tank after this exposure showed average nickel content of 0.15 ppm. In another plant where pure phenol is stored in a 10,000 gal. nickel-clad steel tank the average nickel content of phenol after 28 days storage was 0.21 ppm.

Inconel and Monel generally show about the same corrosion resistance as nickel although they may not be as free from discoloration of the high purity product over long storage periods. All three materials are suitable for handling the phenol-water solutions used for sterilizing purposes. All three materials have been used for reaction kettles in the production of phenol-formaldehyde resins.

Carbon and Graphite

J. F. REVILOCK, National Carbon Co., Cleveland, Ohio.

Carbon, graphite, and impervious carbon and graphite have been proved chemically resistant by laboratory tests and commercial applications to all concentrations of phenol at temperatures known to exist in most industrial processes involving phenol. Carbon and graphite are not limited by temperature in non-oxidizing atmospheres.

The most important applications are with phenol or phenolic derivatives in combination with chlorinated hydrocarbons, chlorine, hydrochloric

acid, or caustic—resulting in corrosive conditions more severe than with phenol alone. Carbon tube and shell exchangers are used as the reboilers, feed preheaters, and condensers for the separation of phenol from benzene in the Raschig process, with HCl and chlorobenzene present in slight amounts. The bubble cap trays in the fractionating column, 10 ft. 8 in. diam. in one installation, are fabricated from graphite. Carbon brick linings, carbon packing support grills, and carbon Raschig ring packing are used in the various high temperature-high pressure reaction towers, in the hydrogen chloride recovery system, and in the phenol extraction tower. Transfer of the corrosive solutions in the process is handled by impervious graphite pumps.

Worthite

W. E. PRATT, Worthington Pump and Machinery Corp., Harrison, N. J.

Phenol is practically non-corrosive to Worthite under all conditions. The Corrosion Handbook (p. 157) shows corrosion rates in crude phenol at 212 deg. F. for six grades of stainless steels at less than 0.004 ipy. The corresponding corrosion rate for Worthite is less than 0.0001 ipy.

Worthite pumps and valves are used in quantity by manufacturers of phenol and by the various users of phenol such as manufacturers of resins, plastics, pharmaceuticals, picric acid, and dyes.

When a new phenol plant using the sulphonation process was built about 10 years ago, an exhaustive test program was instituted to select the best and most economical materials for pumps, valves, tanks and piping. The final tests were made on 12 different alloys. From these final tests Worthite pumps and valves were selected for use in sulphonation, fusion, acidification, distillation, and recovery. This plant recently ordered a large number of Worthite pumps and valves for a new expansion.

Another important property of Worthite pumps is their excellent resistance to erosive action in the handling of phenol-lime slurry solutions. About twelve years ago one of the large manufacturers of phenol and other coal-tar products replaced

a cast iron pump with a Worthite pump. The cast iron pump had required replacement about every three months handling a phenol-lime slurry of about 50 percent solids. This Worthite pump is still on this job along with 50 to 60 other Worthite pumps that have been installed since this first trial.

Hastelloy

E. D. WEISERT, Haynes Stellite Co., Kokomo, Ind.

Solutions of pure phenol have essentially no effect upon the Hastelloy alloys, regardless of the concentrations or temperatures involved. When more severely corrosive agents (especially the mineral acids) are present in processes involving phenol, Hastelloy alloys are particularly economical.

For instance, a preliminary step in making phenol by the sulphonation process is the production of benzene sulphonic acid. This is accomplished by passing hot benzene vapors into a bath of concentrated sulphuric acid. Hastelloy alloy D gives excellent service in downcomers used to introduce the hot vapors. Other Hastelloy alloy parts that are supplied for use in the various processes for producing phenol are thermowells, agitators, and control valves. When hydrochloric acid is involved in the production of phenol, as in the chlorobenzene process, Hastelloy alloy B is commonly used, primarily as protection tubing in instrumentation and similar applications.

Other applications of the Hastelloy alloys in connection with phenol are suggested by the following:

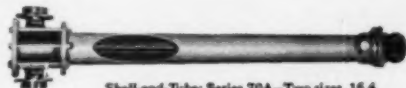
A spool was immersed for 40 days in the reactants producing phenol sulphonic acid. Phenol is treated with 98 percent sulphuric acid and allowed to react for 12 hr. at 120 deg. C. After the sulphonation is complete, water and formaldehyde are added to produce 30 percent phenol sulphonic acid at 70 deg. C. The solution is then neutralized with borax and concentrated ammonia to a pH of 3. In this test, Hastelloy alloy B showed a corrosion rate of only 1.6 mils per year with no pitting.

A spool was immersed for 329 days in the lower well of a phenol tower in sodium phenolate containing about
(Continued)

"KARBATE" BRAND IMPERVIOUS GRAPHITE HEAT EXCHANGERS FOR ALL PURPOSES!

The "Karbate" impervious graphite heat exchangers illustrated are used extensively as boilers, coolers, condensers, vaporizers, evaporators, heaters and absorbers in handling corrosive chemicals, either hot or cold. They *all* can be had in a complete size range. *All of them* offer the following advantages:

- Highest heat conductivity rate of the practical corrosion-resistant materials.
- Highly resistant to corrosion by acids or alkalis, hot or cold.
- Freedom from corrosion scale, as compared to metals.
- Immune to thermal shock.
- No contamination of product.
- Strong and easy to install and maintain.



Shell-and-Tube: Series 70A—Two sizes, 16.4 sq. ft., and 24.6 sq. ft. of outside surface area respectively. Tubes easily replaced in the field. Interchangeable single and double-pass construction.



Series 240A—70.6 feet of outside heat transfer surface. Easy tube replacement. Easily converted on job to single, double, or four-pass tube side flow by simple change of fixed covers. Steel, shell, over-size shell connections, impingement plates and drain and vent plugs integral with shell end castings. Stainless-steel baffles assembled with steel tie rods to form protective cage for tube bundle. Removable "Karbate" tube bundle. Write for catalog sections for S-6690, S-6715 for details of applications, maintenance, sizes and characteristics of these exchangers.

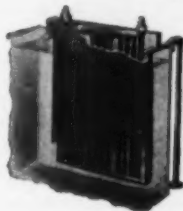
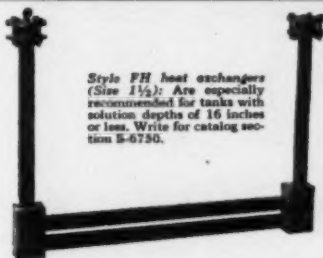


Plate heaters: Used to heat or cool corrosive liquids in tanks and vessels. Compact, completely assembled, easy to put in. Used in pickling, etching, plating and cleaning tanks. Complete size range. Models for horizontal and vertical mounting. Write for catalog section S-6620.



Style FH heat exchangers (Size 1½): Are especially recommended for tanks with solution depths of 16 inches or less. Write for catalog section S-6750.

Cascade coolers: For all cooling jobs involving corrosive gases and liquids. Complete cooler assembly may be made quickly from 4 standard items in 5 pipe sizes. Capacity easily enlarged or reduced by adding or subtracting standard sections. Compact construction to save plant room. No special supporting structure needed. Write for catalog section S-6780.



Concentric Tube exchangers: Available in two types. Series 10A is small, low-priced, gives true counterflow. Exceptionally good for small flow rates at narrow temperature differences. . . . Series 20A manufactured with "Karbate" inner and outer piping, and is used to transfer heat between two corrosive fluids. Both have sectional construction, can be added to or subtracted from at will. Sturdy, can be moved from place to place after assembly, adapted to any method of mounting on floor, wall, or ceiling. Write for catalog section S-6670.

The term "Karbate" is a registered trade-mark of Union Carbide and Carbon Corporation

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A full line of "Karbate" impervious graphite pipe and fittings

for conveying corrosive chemicals includes: "Karbate" pumps of advanced design embodying impervious graphite case, impeller, and a rotary seal which eliminates the stuffing box. Pump prices reduced up to 33%. Write for catalog section S-7000 for pipe information, S-7200 for pump information.

20 percent by volume tar acids and 20 percent by weight sodium hydroxide. The temperature was 120 deg. C. and there was no aeration. Hastelloy alloy C showed no measurable penetration or pitting in this test.

Hastelloy alloy B showed a corrosion rate of only 1.5 mils per year after exposure to the fusion of phenolphthalein for eight batch cycles. In this process, phenol, zinc chloride, and sulphuric acid are reacted at a temperature of 180 deg. F.

High-Silicon Irons

WALTER A. LUCE, *The Duriron Co., Dayton, Ohio.*

Phenol shows virtually no attack on the high-silicon iron alloys and can, therefore, be handled in Duriron and Durichlor equipment with complete safety. It should show no tendency to increase the rate of attack on these alloys by other corrosives.

Durimet 20

WALTER A. LUCE, *The Duriron Co., Dayton, Ohio.*

The high alloy stainless steel, Durimet 20, exhibits excellent resistance to phenol at all temperatures and concentrations normally encountered. This alloy is also suitable when sulphur compounds are present with the phenol and can be utilized with hot phenol vapors at temperatures up to approximately 600 deg. F. Therefore, Durimet 20 pumps, valves, and other equipment can be successfully used in the production and handling of this chemical.

Durimet 20 is available in both cast and wrought form. Castings include pumps, fans, jets, valves and mixing nozzles. Wrought products—wire, rod, bars, strip, welded pipe and tubing—are produced by Carpenter Steel Co. as Carpenter 20.

Aluminum

W. W. BINGER and R. H. BROWN, *Aluminum Co. of America, New Kensington, Pa.*

Aluminum alloys are highly resistant to corrosion by phenol.

The Interstate Commerce Commission has approved the shipment of solid phenol in aluminum drums. Manufacturers of pharmaceuticals and plastics specify aluminum alloy tankage for storage of phenol, not only because of the resistance to corrosion of aluminum alloys but also because

no discoloration of the products results. In the manufacture of explosives, too, aluminum alloys have the special advantage of being non-sparking.

Laboratory data indicate aluminum alloys are suitable for handling phenols up to a temperature of 356 deg. F. providing about 0.3 percent water is present. If the phenol is dried, 248 deg. F. should not be exceeded.

In laboratory tests, aluminum alloy 2S-H14 specimens were virtually unaffected after one month at room temperature in phenol solutions containing from 1/4 to 90 percent by weight phenol purified by distillation. Similarly, at 50 deg. C., tests of one week's duration indicated negligible attack. No pitting was observed in either test and the calculated rate of attack was less than 0.001 ipy.

SERVICE EXPERIENCE

A manufacturer of pharmaceuticals stores phenol solution (90 percent by weight) in a welded 3S storage tank. In the 20 years that this tank has been in service, no corrosion difficulties have been encountered.

In another plant, three aluminum (2S and 3S) phenol resin pressure cookers (50 to 500 gal. capacity) were used over a four to five year period. The process involved a delicate balance of temperature and pressure. It was found that when the conditions were upset so that the temperature and pressure increased, the solution reacted vigorously with the aluminum vessels. Apparently, the increase in temperature had driven off the moisture and dried the phenol.

Aluminum can be used successfully for handling phenol and aqueous solutions of phenol under proper conditions.

Chlorimets

WALTER A. LUCE, *The Duriron Co., Dayton, Ohio.*

Chlorimet 2 and Chlorimet 3 are practically immune to corrosion by phenol at all temperatures and concentrations. The presence of sulphur compounds has no effect on the excellent resistance of these alloys. Hot phenol vapors also have no effect on these alloys up to approximately 600 deg. F.

The Chlorimet alloys find virtually no application for handling phenol because of the excellent resistance of less expensive alloys such as Durimet 20, 18-8-S and 18-8-S-Mo stainless steels, aluminum, steel and others.

However, the good resistance of the Chlorimets is important since there are many severe services where these high alloys are the most economical materials of construction available. The presence of phenol in no way lowers this good resistance to such severe corrosives as hydrochloric acid, sulphuric acid and others.

Glass Lining

S. W. McCANN, *The Pfudler Co., Rochester, N. Y.*

Glass-lined steel equipment is widely used in processing phenol and is resistant to all concentrations at elevated temperatures. Very large units (up to 25,000 gal.) for storage of water-white phenol have been made. Other smaller units for distilling, condensing, and receiving are in use.

Coatings

KENNETH TATOR, *Kenneth Tator Associates, Coraopolis, Pa.*

The following facts seem to stand out:

1. Mild steel is generally used and corrosion is not excessive except in local areas of hot concentrated vapors.
2. Rubbers and thermoplastics are not generally suitable.
3. The thermosetting phenolics and furans are suitable and are occasionally used where iron-free phenol is required.

Stainless Steel

GRANT L. SNAIR, JR., *Allegheny Ludlum Steel Corp., Brackenridge, Pa.*

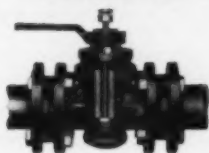
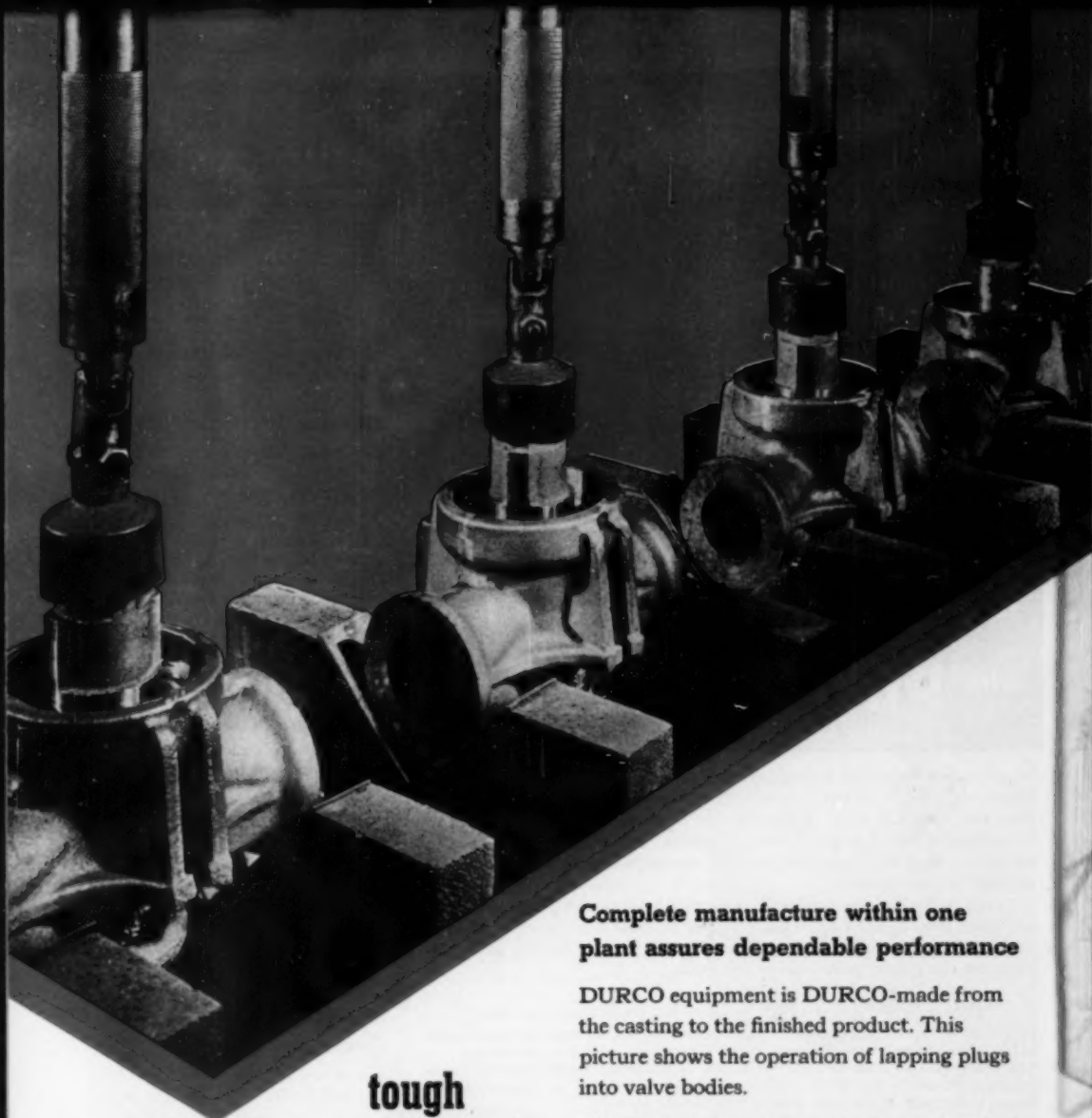
While stainless steel Types 304 and 316 are satisfactory in many phases of the refining of phenol, solutions containing appreciable amount of water may prove to be vicious pitting agents. In such cases, Type 316 is more resistant.

Types 410, 430, 304 and 316 are unattacked by the non-aqueous liquid at low temperatures.

Types 304 and 316 satisfactorily withstand phenol in almost all applications except where some unusual service conditions or contaminants are involved. Equipment made of these stainless grades will safely handle either the crude or chemically pure compound at all temperatures including boiling. Type 316 is preferable in exposure to hot vapors and in the presence of crystals.

Many applications also are found for stainless steel in the chemical processing industries using phenol.

(Continued)



The DURCO Type D Plug Valve

**tough
chemical
service
calls for
DURCO
equipment**


**Complete manufacture within one
plant assures dependable performance**

DURCO equipment is DURCO-made from the casting to the finished product. This picture shows the operation of lapping plugs into valve bodies.

DURCO engineers are ready to work with you on any problem of handling corrosive solutions. With materials in short supply, the experience of these engineers may help in selecting less critical alloys for your requirements.

Call the DURCO engineer in your area,
or write

**THE DURIRON COMPANY, INC.,
DAYTON 1, OHIO**



AT THE
WORTHINGTON PUMP
AND MANUFACTURING
CORPORATION,
Buffalo, New York

tank heating is faster, costs less
with **PLATECOILS**
(REPLACE PIPE COILS)

Worthington Pump and Manufacturing Corporation has found that it costs less to buy and use Platecoils in their Parkerizing tanks than it does to make their own steel pipe coils. When the steel pipe coils were used, they had to be replaced on the average of every 3 months. The Platecoils have been in use over a year, and there have been no repairs or expenses other than the original installation cost.

Platecoils heat the tanks faster because they have greater prime surface in any given area. A 22" x 47" Platecoil gives the same heat transfer surface as 32 ft. of 1½" pipe. This not only means quick starts in heating tank solutions but also greater tank capacity for work.

"quick change hangers" make installation easy

By the use of "quick change hangers," Platecoil installations can be made in open tanks in a half hour or less by one man and a helper. There is no welding or pipe cutting . . . two connections to make and the installation is complete. Should repairs become necessary, Platecoils can be removed and replaced in a matter of minutes without emptying the tank. Replacement is made from outside the tank.

Let us show you how you can conserve steel and save time, money and manpower by using Platecoils for tank heating or cooling. Write today for bulletin No. P61.

PLATECOIL GIVES YOU MANY ADVANTAGES

- Cheapest and Dependable Method of Heating Tank Solutions
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- Increased Tank Capacity
- Fast, Easy Installation
- Easy to Clean

PLATECOIL
KOLD-HOLD MFG. CO.
LANSING 4, MICHIGAN

CORROSION FORUM, cont. . .

particularly in the manufacture of other chemicals and drugs, dyes, high explosives and synthetic resins. Here reactors, agitators, centrifuges, storage vessels, pipelines, valves, and fittings of Types 304 and 316 are especially practical. Welded vacuum mixers for processing phenol compounds in the plastics industry are fabricated from Type 347.

Certain sterilizing solutions containing carbolic acid used in hospitals tend to pit Type 304 unless exposure is limited to short periods of time.

Silicones

J. A. McHARD and LEON VAN VOLK-
ENBURG, Dow Corning Corp., Mid-
land, Mich.

Most silicone products show fairly good resistance to phenol even at temperatures as high as 100 deg. C. Resistance in certain silicone fluids and elastomers is reduced, however, by the partial solubility of these materials in phenol.

Silicone rubber shows generally good resistance in contact with 85 percent phenol at room temperature. Increase in weight is temporary. The phenol absorbed by the test samples evaporates on standing. No permanent loss in Shore hardness or elasticity was observed. The rubber shows less resistance to 70 percent phenol at 100 deg. C. Some permanent loss in elasticity was noted.

The silicone resins, as represented by three electrical insulating materials and by two of the resins used in formulating protective coatings, show remarkably good resistance to USP phenol at 100 deg. C. Resistance was judged by changes in weight and appearance.

Cements

RAYMOND B. SEYMOUR, The Atlas
Mineral Products Co., Mertztown, Pa.

Carbon or silica-filled phenolic or furfuryl alcohol type resinous cements are completely resistant to aqueous solutions of phenol and phenol itself at temperatures ranging from 70 to 220 deg. F. Silicate cements are also resistant but the phenol tends to crystallize within the pores of the highly absorptive silicate cement resulting in mechanical disintegration when the cement is not completely immersed in the liquid at all times.

Sulphur cements, portland cement and its admixtures, and Thiokol cements are attacked by phenol even at low temperatures. A proprietary ce-
(Continued)



Background for better detergents

More than a billion pounds of household and industrial cleaning compounds have been produced with synthetic detergent materials made by Oronite.

This broad acceptance is proof of the high regard which leading compounders, processors and end-users hold for Oronite products. Large-scale production facilities and experience provide Oronite the background for better detergents and make Oronite a most important source of supply.



THE NAME TO WATCH IN DETERGENTS

*A partial list of
other Oronite Chemicals*

NOTICE

Some of the following are
currently in short supply.

Detergents Alkane
Detergent Slurry
Detergent D-40
Detergent D-60
Wetting Agents
Lubricating Oil Additives
Cresylic Acids
Gas Odorants
Polybutenes
Sodium Sulfonates
Purified Sulfonates
Naphthenic Acids
Phthalic Anhydride
Ortho, Para Xylenes
Xylol
Aliphatic Acid
Hydroformic Catalyst

THESE EXTREMELY VERSATILE SYNTHETIC
DETERGENTS FIND A WIDE VARIETY OF
USES THROUGHOUT INDUSTRY

Four Examples:

1. FOOD AND VEGETABLE PROCESSING

A tremendous aid in washing, peeling and processing fruits and vegetables before canning or freezing. Improves their marketability and aids in the removal of dirt, insecticide and fertilizer residue.

2. UPHOLSTERING AND RUG CLEANING

These detergent products find widespread use in plant or "on-location" cleaning of rugs, carpets and upholstery. Excellent foaming qualities, easy rinsing and high efficiency in cleaning greasy type soil make them ideal for this purpose. Use them straight or in special compounds depending upon type of application.

3. CLEANING AND WASHING COMPOUNDS

Oronite supplies tremendous quantities of synthetic detergent materials to processors and compounders of packaged cleaners for all household and industrial uses.

4. TRANSPORTATION EQUIPMENT WASHING

Because of its fast action, quick rinsability and high detergency, Oronite D-40, either alone or in compounds, cuts cleaning and maintenance costs on trucks, trains, busses, passenger cars and other types of rolling stock.



ORONITE CHEMICAL COMPANY

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824 WHITNEY BLVD., NEW ORLEANS 12, LA.

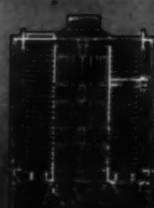
The VERTICAL TURBO-DRYER
CONTINUOUS TRANSFER TYPE

Combines— with—

Gentle Handling	Low Power
Uniform Drying	Reduced Space
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• **FOR DRYING**
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Available in packaged unit for glass and metal products. Field tested units up to 100 tons capacity per hour.



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A complete line of sulfur base, resin base, plastic and silicate cements. Write for bulletin 3-1.

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Permanent floors for chemical process, steel, textile, food industries, etc. Write for bulletin 3-1.

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Smooth Vibrationless PROPELLERS

for MIXING, STIRRING
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AGITATION



A Michigan 34" Stainless Steel propeller with split hub for mounting in receptacle through manhole.

Manufactured by an exclusive process, Michigan propellers are perfectly balanced to avoid whip and strain on shafts. They are available for original equipment, replacement or special application in a wide range of materials and in sizes up to 60". Write for latest data folder.

MICHIGAN WHEEL CO.
GRAND RAPIDS 3, MICH.

CORROSION FORUM, cont. . .

ment based on Thiokol was completely dissolved by an aqueous solution of phenol at room temperature. Two different proprietary thermosetting cements were completely dissolved by phenol.

In the absence of alkalis, either phenolic or furfuryl alcohol type resin cements are recommended. In the presence of alkalis only furfuryl alcohol type cements should be used with either phenol itself or its aqueous solutions.

Structures constructed from these cements are satisfactory for storage or processing involving phenol.

Iron and Steel

ALBERT W. SPITZ, Reiter Engineering Co., Philadelphia, Pa.

Cast iron and carbon steel are extensively used for tanks, pumps and piping in crude phenol service. Phenol in cast iron or carbon steel equipment will darken and pick up some iron, hence more resistant materials are usually used for handling pure phenol. The corrosion rate even with pure phenol is quite low at atmospheric temperatures.

Tantalum

LEONARD R. SCRIBNER, Fansteel Metallurgical Corp., N. Chicago, Ill.

Phenol does not attack tantalum at any concentration or temperature. While tantalum is not usually considered necessary in the handling of phenol, it is used in the Raschig process for production of phenol and in the synthesis of monochlorobenzene.

Rubber Lining

J. P. McNAMEE, U. S. Rubber Co., Providence, R. I.

Natural and synthetic rubber linings should be used only for weak aqueous phenol solutions. The hard compositions are more resistant to phenol than soft compounds but extreme care must be exercised in choosing a lining for this service.

Lead

KEMPTON H. ROLL, Lead Industries Assn., New York, N. Y.

Aqueous solutions of phenol up to 100 deg. C. can be used satisfactorily with lead. Corrosion rates depending on service conditions may be expected to vary within the range of 0.005 to 0.05 ipy.

—End

power modernization

lowers production costs...

with

control
of speed

A manufacturer* of food processing machinery states,
"Speed-Trol made possible the design of a new
de-watering press which resulted in:

- 26% greater moisture extraction... plus corresponding savings in the reduction process... plus perfect control of moisture content."

*(Name upon request)

STERLING SPEED-TROL

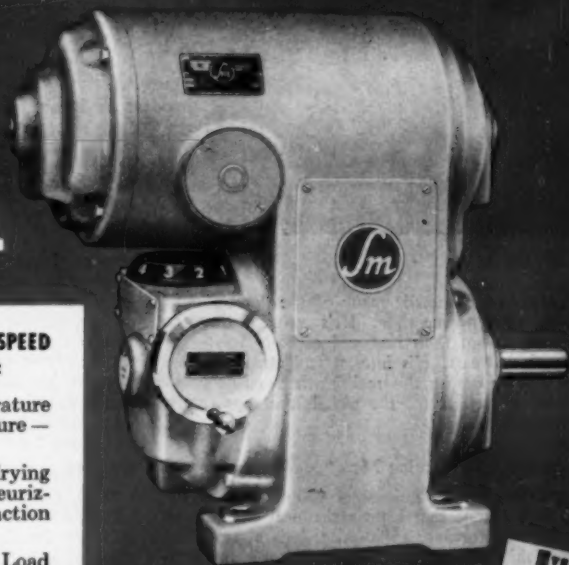
...GIVES YOU VARIABLE SPEED CONTROL NECESSARY FOR:

PROCESS CONTROL OF: Temperature
— viscosity — level — pressure —
flow — etc.

TIME CONTROL OF: Baking — drying
— heating — cooking — pasteurizing
— soaking — chemical action
— etc.

EQUIPMENT ADAPTATION TO: Load
variation — sequence synchroniza-
tion. Size — tension — hardness
or shape of materials to be pro-
cessed — machined — conveyed —
blended — mixed — etc.

VARIATIONS IN: Quality — quantity
— operators' abilities — etc.



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The Key to Personal Success in Engineering



PHILIP W. SWAIN

... has known personally many of the "greats" and "near-greats" of our generation. He's watched them at work and at play—at their best and at their worst—for more than thirty years. His interest and attention have given him a sharp eye for the qualities that make successful engineers as well as for the pitfalls that can trap a promising engineer.

Why Shouldn't I Be Earning More?

Getting down to this business of going places in engineering, let's assume that I am a chemical engineer, or a mechanical, electrical or civil. Also, let's assume that I am doing fairly well, but am not satisfied with my earnings. Neither is my wife. I want to know what I can do about it, and I wonder how I can get ahead.

So I take a good look at some fellow engineers who have been more successful than I have and ask myself, "What have you fellows got that I haven't got?" Perhaps some of you are just plain lucky, but that can't be true in every case.

Well, maybe I'm working for a dumb boss, one who doesn't appreciate my abilities. If that's the case, I should get another job. But suppose the new boss also doesn't appreciate me. Maybe he's another dumb fellow. So, I go and get myself a third job. If this boss also fails to appreciate me, I begin to think that my real trouble is neither bad luck nor a bad boss, but something wrong with the way I operate.

At this point, I am going to shift from the role of discontented engineer and become Phil Swain again. Let me report my observations—what I see in the people who get ahead and those who don't.

I have had the opportunity of sitting in private conference with many of the top industrial executives of

How to . . .

**Earn More . . . Rise higher
. . . Get more fun out of life**

"Pick the right boss and proceed to make his life easy."

"Learn young how to meet people, sell things, handle tools, do the everyday chores of business and industry."

"The engineer who is a warm, expressive human being will always stand out in the crowd of overly modest and tongue-tied technologists."

Phil Swain

America. I have studied them with much curiosity, trying to figure out what breed of men they are and how they get where they are.

I suspect that a few of them are in their present jobs because they have cousins, but I would estimate that 80 percent of the men in top-flight industrial jobs are where they are because they belong there. There's so much money at stake that boards of directors and stockholders are not likely to entrust the direction of a business to men who haven't got what it takes.

What Does It Take to Make an Executive?

Well, then, what does it take? What is this typical industrial executive like? He is very human. He is definitely intelligent, although rarely a genius. He is progressive, but never fanatical. By the way, have you heard the definition of a fanatic? A fanatic is a man who redoubles his efforts after he has lost sight of his objective.

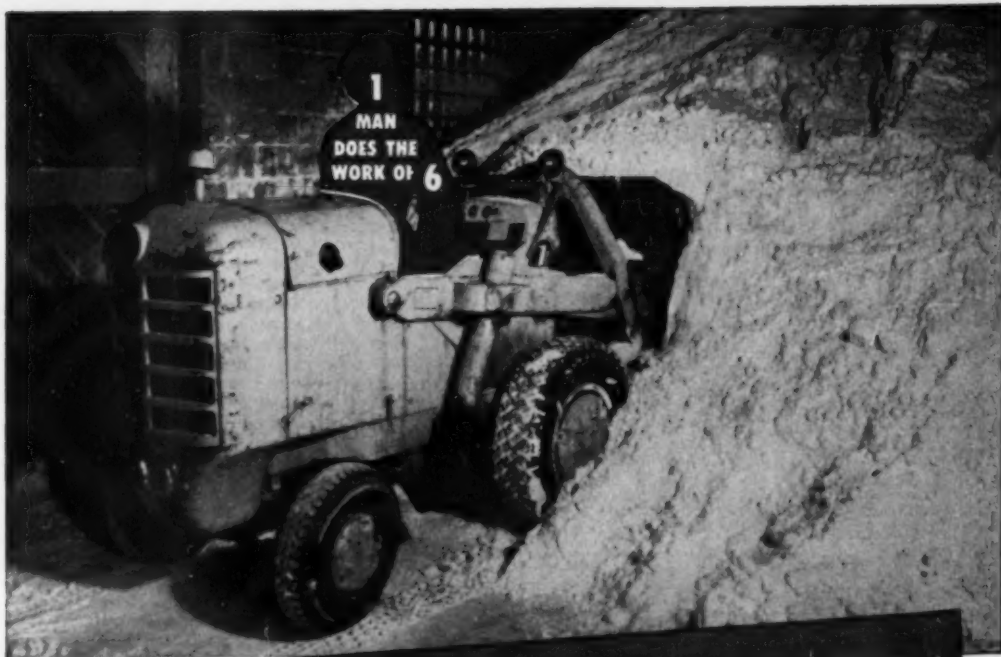
This typical industrial executive has common sense. He is not a stuffed shirt. He doesn't pose as a big shot. On the other hand, he is not afraid to take responsibility and make big decisions, after knowing all the facts.

This executive doesn't have a one-track mind. He never gets so interested in one little angle of the business that he forgets what the whole thing is about. He is never one of those who can't see the woods for the trees.

He is not a man to go arguing about details before he knows where he is trying to go. Yet he has the urge to move ahead. He has imagination.

And this typical successful industrial executive has in almost every case an above-average ability with his language. He knows how to speak and write in a way that will produce teamwork and results. His English may be polished, or it may be of the rough-hewn variety, but in either case, he uses written and spoken words to make people

(Continued)



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The 12 cubic foot Model HA shown is the smallest of the PAYLOADER line that includes graduated sizes up to 1½ cubic yard bucket capacity. Every PAYLOADER is a complete, Hough-built tractor-shovel specifically designed with multiple reverse speeds and other features that insure fast, low-cost bulk material handling. They are backed by 30 years of material-handling equipment manufacture and are sold and serviced by a world-wide Distributor organization. The Frank G. Hough Co., 754 Sunnyside Ave., Libertyville, Ill.

Literature on any size PAYLOADER will gladly be sent without obligation.



On These Jobs

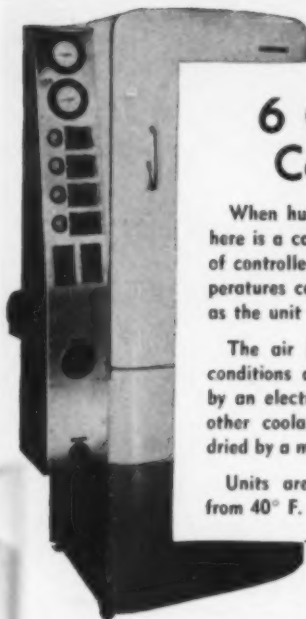
- Unload box cars
- Dig and carry fertilizers, chemicals, all loose materials
- Feed conveyors, hoppers, baggers, elevators
- Unload trucks
- Load box cars
- Carry bagged materials
- Clean up aisles, gangways
- Maintain private roadways
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The air is constantly circulated and uniform conditions are maintained automatically; heated by an electric coil, cooled by a coil of water (or other coolant), humidified by a spray chamber, dried by a mechanical device needing no attention.

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YOU AND YOUR JOB, cont. . .

understand what should be done and want to work with him to get it done.

This gift with words is, of course, merely a major tool of salesmanship. Every successful industrial executive, in fact, almost every successful man in any line—has salesmanship. By this I don't mean just selling goods or knowing how to sell goods. I mean a certain kind of skill that is used in all human effort—skill in getting people to work with you.

Success isn't a matter of how hard you work, but of how hard you can induce others to work with and for you. This sounds cold blooded, but I don't mean it that way. I'm not talking about slave driving. I'm talking about leadership, something that is absolutely essential in this world and something most people are glad to leave to others.

What Must I Learn?

The engineer who wants to go places must, of course, know his job and what he wants to do. He must learn the art of cooperation and salesmanship. He must learn how to win the loyal cooperation of those who work with him, alongside of him and over him. If he is able to win cooperation, he will get results, and if he gets results, he will be indispensable. And if he is indispensable, he will be paid well or can go someplace else where he will be well paid.

How do you learn salesmanship, you ask? First, you have to be interested in other people. By long observation, you learn why they sometimes do what you want and why they sometimes do not. By constant study and experiment, you learn how to handle yourself in such a way that people will work with you. You learn how to use words skillfully. You learn when to talk and when to keep silent. You become a practical psychologist.

Above all, you learn how to put yourself in the other fellow's shoes. Probably he's not an engineer. He doesn't think the way you do. He doesn't understand your language and he won't learn it. You'll never get anywhere dealing with him until you learn to understand and speak his language, and until you learn to deal with a mind that is not logical like yours is.

The extremely logical training of an engineer can be an actual handicap in dealing with other people until he learns how to keep it under control. To get things done on a big scale you have to deal with people who are not engineers. Many of them will be intuitive rather than logical.

This reminds me of the school boy who was studying arithmetic. The

teacher asked: "Johnny, there are twenty sheep in a field and one jumps over the fence, how many are left?" Johnny answered "none." The teacher said "you don't know arithmetic, Johnny." Johnny replied "teacher, you don't know sheep."

Many people are like the man who could never fix his roof because when it was raining he couldn't get at it, and when it stopped raining the roof didn't need repair.

Others are like the Chinese in the debating society trying to decide which is the greater boon to mankind, the moon or the sun. They decided the moon was the greater boon because it shines at night when you need the light.

If you, as an engineer, are going to deal successfully with people who think that way, you will need to develop your imagination. Imagination is one of the primary elements in salesmanship because you always have to be able to imagine that you are the other fellow and imagine how you would react to a given proposition.

This brings me to a big point. To go places, an engineer must also be something of a business man. Your plant is a department of some business and should be run as such.

You have an office. Does it look like a business office or the corner of a junk yard? A little window dressing in this part of your plant will be a big help in winning the respect and active cooperation of a business minded management.

Set up sound records and filing systems and periodic reports. Learn the arts of writing effective reports, memos and letters. They can make or break you.

From what I have said, or failed to say, you might get the idea that I don't attach much importance to engineering knowledge. I think that my whole career, and the job I am in (Chief Editor, "Power"—Ed.) should dispel any such notion.

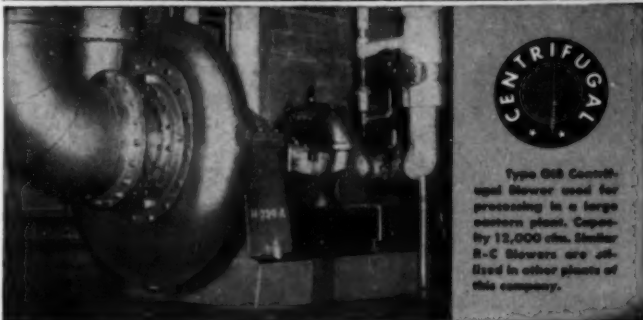
I won't take much time on this angle, but would like to pass along a few tips on the art of learning. We all need to learn. Above all we need to learn the kind of thing we are not good at.

For the college-trained engineer that means a great need to learn the practical side of engineering. And the rule works both ways. A lot of practical men miss bets because they are weak on theory. They would get ahead faster if they had a better understanding of the fundamentals.

I hope I've made it clear that being a successful engineer means being fairly good at a lot of different things. For personal success an engineer must learn the parallel arts of salesmanship, cooperation and leadership. —End



*"always glad to see you...
but we seldom need help!"*



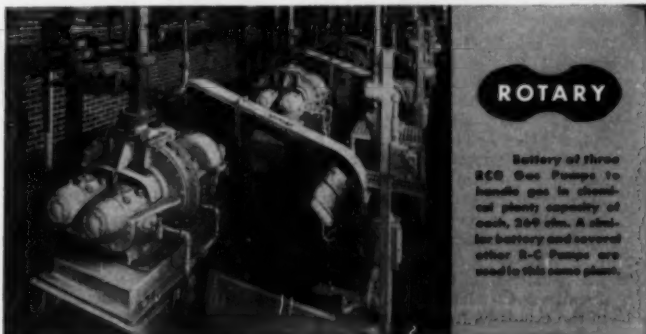
Type 608 Centrifugal Blower used for processing in a large chemical plant. Capacity 12,000 cfm. Similar R-C blowers are utilized in other plants of this company.

The works manager of a large plant made this friendly statement to a Roots-Connorsville representative. What he really meant was that R-C Blowers and related equipment perform so satisfactorily and dependably that they seldom need anything more than routine inspection by his own men.

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ROOTS-CONNERSVILLE



ONE OF THE DRESSER INDUSTRIES

Names in the News Edited by Frances Arne



MAN OF THE MONTH: Thomas H. McCormack

How does a chemical industry man fare while on leave from his firm to work for the government in the OPS? What does he do? What problems does he face?

To get the answers *Chemical Engineering* last month tracked down the top chemical man in OPS—Thomas H. McCormack. Since 1944 director of sales for Du Pont's Grasselli Chemicals Department, McCormack is now director of OPS' Rubber, Chemicals and Drugs Division.

Both the outer office and his inner "private" office doors were wide open the morning *Chemical Engineering's* re-

porter called on him. While this is typical of McCormack, it is also perhaps typical of the industry man in government. He does not work behind closed doors. He does not have a "private" secretary. The two secretaries in the front office were not only stenographers, but receptionists and file clerks as well for both McCormack and his assistant, acting assistant director George W. Strasser.

The private office actually turned out to be the conference room as well, for McCormack's desk was pushed tight against two tables end to end, forming a large "T"-shaped conference area.

Behind the desk was our quarry. Once a *rara avis* in government, the industry man now runs most of the defense agencies. In NPA and OPS they are indispensable. Career government officials are first to admit that. Government routine and personnel are not set up to deal with emergencies.

McCormack is also typical of the experienced industry man in Washington. Most of the branch and division chiefs are also top people in their firms.

McCormack joined the Grasselli Chemical Co. as a chemist in the East Chicago plant in 1920. In 1933 he was advanced to plant manager at the company's Cleveland, Ohio, plant. When the company became the Grasselli Chemicals Department of the Du Pont company in 1936, McCormack continued his service there. He held posts in Grasselli, N. J., and Wilmington, Del., and was advanced to director of sales in 1944.

A native of LaSalle, Ill., he attended the University of Illinois where he received an AB degree in 1920. He is 55 now.

Mutual trust was the first thing that McCormack brought out as helping him in his job. The people he deals with are from his industry. He knows many of them intimately, and knows their firms. This results in trust in each other, he said. It also means cooperation.

(Continued on page 239)

Walter G. Whitman. Nominated by President Truman to the chairmanship of the Research and Development Board, Defense Department unit charged with initiating, supervising and coordinating scientific research for the military departments. Has been head of MIT's chemical engineering department since 1934. During World War II, in charge of basic chemical division. Since 1949, on the RDB committee on fuels and lubricants.

W. H. Sheffield, Jr. President of Innis Speiden & Co., Inc. Also a director of the company, International Minerals subsidiary which has just undergone an organizational revamping.

Kenneth Berger. President, Chemical Market Research Assn. With Esso. Vice president: George Ruger of Diamond Alkali. Treasurer: Fritz

Von Bergen, Westvaco. Corresponding secretary: S. D. Koonce, Jefferson Chemical.

Thomas S. Nichols. Resigned as deputy administrator, NPA. Resumes post as president and chairman of the board of directors, Mathieson Chemical Corp.

Wilhelm Hirschkind. With the division of rubber, chemical and drugs, OPS. On leave from Dow's Great Western Division.

G. G. Oberfell. Winner of the Distinguished Service Award, Liquefied Petroleum Gas Assn. Retired vice president of Phillips Petroleum; consultant for RFC.

Riki Kobayashi. Assistant professor of chemical engineering, Rice Institute, Houston. Formerly with Continental Oil.

C. W. Johnston. Head of the resin research section, Baltimore laboratories of U. S. Industrial Chemicals. With the company since 1940. Columbia graduate.



R. L. Marion



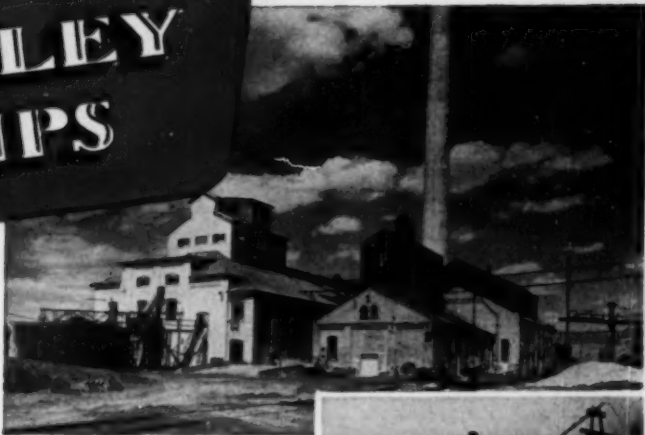
C. W. Johnston

Richard L. Marion. Research chemist, Sun Rubber Co., Barberton, Ohio. For the past four years, instructor in chemical engineering at Fenn College, Cleveland. Previously, senior research engineer, National Anion (Continued)

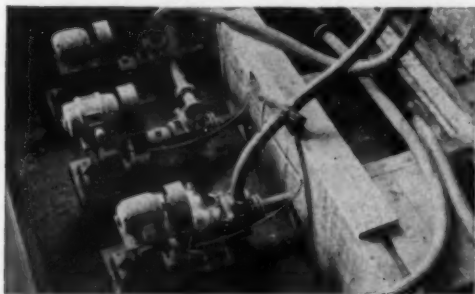
WILFLEY PUMPS

Used At...

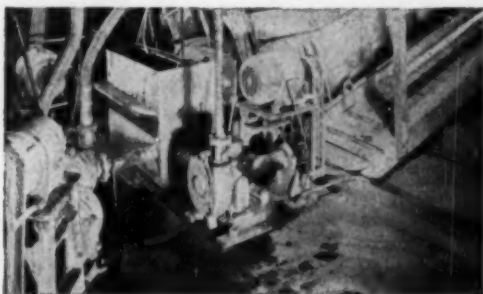
Climax URANIUM PLANT



The great CLIMAX URANIUM COMPANY PLANT at Grand Junction, Colorado, built primarily for uranium processing, uses WILFLEY pumps throughout. WILFLEY Model K sand, Model AF acid, and plastic lined acid pumps maintain continuous, trouble-free, high-efficiency performance with leaching solutions, tailings, vanadium and uranium leach liquors, dilute acids, sand slime, roaster calcine and other chemical solutions. Individual engineering on every application. Buy WILFLEY for lower production costs. Write or wire for details.



Plastic Lined Pumps in Tank House. These acid-proof pumps receive vanadium and uranium leach liquors from leaching tanks and pump them to various treatment tanks located in the main portion of the building.



Grind Circuit Circulation Model K Pumps. These sand pumps receive the classifier overflow and pump the material to the sand slime separation circuit located at a higher elevation.

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NAMES IN THE NEWS, cont. . .

line Division. Studied at Purdue, Buffalo University, Case Institute.

H. G. Thode. President of the Chemical Institute of Canada, 1951-52. Principal of Hamilton College of McMaster University and head of the department of chemistry and director of research. Studied at the universities of Saskatchewan and Chicago. Vice president: **Robert S. Jane**, vice president in charge of research and development and also a director of Shawinigan Chemicals Ltd.

O. P. Puryear. Assistant to the director of technical services, Texas Co. Formerly supervisor of the grease research department at the company's Beacon Laboratories. With Texaco for 25 years. Chemical engineering graduate of Texas A & M.

Lyman H. Allen, Jr. Division engineer, viscose section, central engineering department, Celanese Corp. of America. Formerly with Foster D. Snell.

Glenn W. Martin. Plant superintendent of the new soybean extraction plant at Rossford, Ohio, of the chemical division of General Mills. Formerly plant engineer at the division's Belmond, Iowa, plant.

Donald H. Wheeler. To direct a basic research program on the chemistry of drying oils for General Mills; also consultant on all chemical operations. Formerly director of technical sales and service for the company's chemical division. On research staff, 1943 to 1949.

Cole Coolidge. Director, chemical department, E. I. du Pont de Nemours. With the department since 1923: chemist, group leader, assistant director of Du Pont Experimental Station, assistant director of the department. Studied at the University of Colorado and Ohio State (Ph.D., 1923). He succeeds **Elmer K. Bolton**, retiring after 21 years as director.

Phillip H. Groggins. To head up the newly organized agricultural chemicals sections of NPA's chemical division. Has been technical adviser of the U. S. Department of Agriculture's Bureau of Agricultural and Industrial Chemistry. During World War II: chief of the chemicals and fertilizers branch of the War Food Administration.

Karl C. ten Brink. From chemical engineer to assistant director of producing research, Bellaire Laboratories, Houston, of the Texas Co. With company since 1947. Graduate of Rice Institute (Ph.D. in chemical engineering).

Henry W. Winkler. Vice president in charge of research and laboratory control, Brooks Oil Co. For eight years chief chemist of the company. Previously with Atlantic Refining Co., Galena Oil Corp., Valvoline Oil Co. Graduate of Allegheny College.

Charles A. Thomas. President of Monsanto Chemical Co. Has been chairman of the executive committee since 1949. Director of the company since 1942; vice president and member of the executive committee since 1945; executive vice president since 1947.

Herbert H. Clarke, Jr. Vice president of Borden Co.'s chemical division. With Borden since 1940, most recently as manager of West Coast operations.

William W. Niven, Jr. Chairman, chemical engineering division, Mid-

west Research Institute, Kansas City, Mo. Associate director for engineering: **Martin Goland.** Associate director for chemistry: **Max H. Thornton.** Chairman, chemistry division: **W. Sherman Gillam.**

J. Wilson Setzer. President, North Carolina Water Works Operators Assn. Chemist with Gastonia, N. C., utilities department.

Henry C. Speel. Director of the development department, Wyandotte Chemicals Corp. Formerly with General Dyestuffs Corp., Atlas Powder Co., General Mills, Alrore Chemical Co., General Aniline and Film Corp.

R. J. Turner. Chief chemist for pharmaceuticals, Calco Chemical Division, American Cyanamid. Joined Calco in 1944 as research chemist in the pharmaceutical department; transferred to the process engineering department for pharmaceuticals, 1949. Yale graduate.

William A. Bours. Manager, plants development section of Du Pont's organic chemicals department. Has been senior technical assistant in (Continued)



THIS YEAR'S MCA OFFICERS

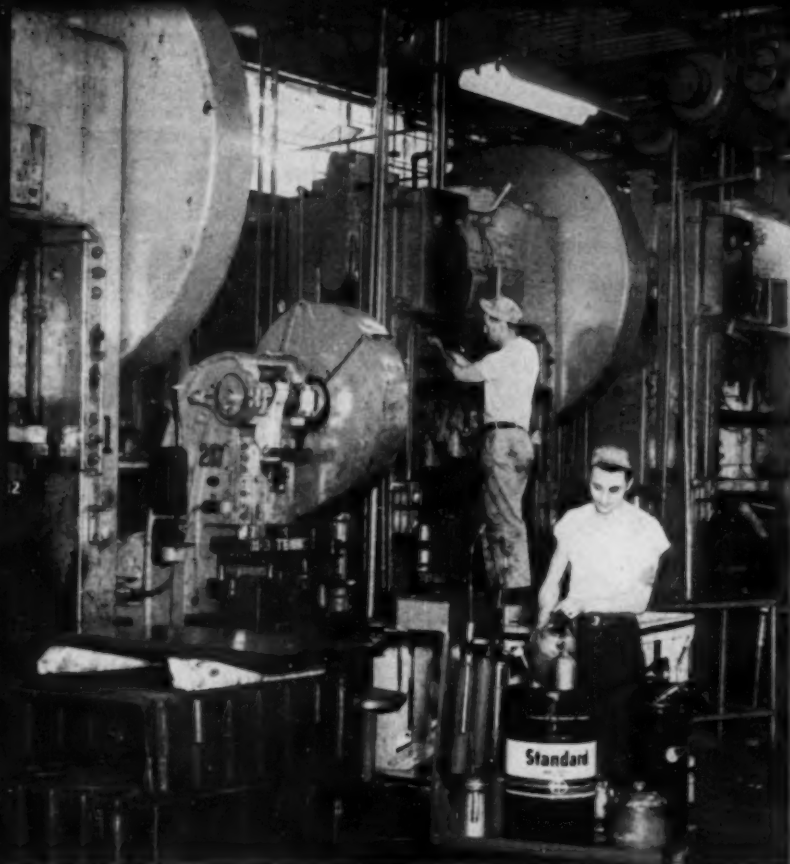
George W. Merck, Charles S. Munson, William H. Ward.

Manufacturing Chemists Assn. has just reelected: George W. Merck, president; Charles S. Munson, board chairman; William H. Ward, vice chairman; James McLaughlin, treasurer. Also reelected at the annual meeting were H. O. C. Ingraham and R. C. Gaugler, vice presidents. Robert L. Taylor, executive vice president, and Maurice F. Crass, secretary, continue to head the enlarged staff of the association in New York and Washington.

By amending its by-laws, MCA voted to expand its board of directors from 18 to 21 members with three classes of seven directors each serving for terms of one,

two and three years respectively. No director is permitted to serve more than two successive terms. Retiring from the board in 1952 will be G. W. Merck, J. W. McLaughlin, C. D. Marlatt, C. S. Munson, H. O. C. Ingraham, W. S. Landes, and H. I. Young.

Directors elected this year for the 2-year term: Philip Sharples, W. M. Billing, W. H. Ward, L. I. Doan, H. W. Fisher, W. S. Richardson, and D. S. Frederick. Those elected for three years: J. E. McKeen, R. C. Gaugler, F. N. Williams, G. B. Beitzel, R. B. Semple, R. L. Murray and Jan Oostermeyer.



No drips in this press room

WHEN plant engineers at the A. O. Smith Corporation Kankakee Works tested STANODRIP Dripless Oil No. 59 on the recommendation of a Standard Oil lubrication specialist, they found the solution for press room lubrication troubles.

STANODRIP ended the drippage of oil from bearings on stamping and punch presses. That meant cleaner and safer working conditions, less lubricant consumption, and fewer lubrication applications. As a result, STANODRIP is now used throughout the press room and is being adopted by other departments as well. "Reduced maintenance costs and longer life of our equipment are definite advantages . . .," says Don Hartquist, Plant Engineering Supervisor.

To help put STANODRIP Dripless Oils to work wherever leakage or drippage is a



problem . . . or for assistance in all phases of industrial lubrication . . . call in the Standard Oil lubrication specialist in your area. Contact your local Standard Oil Company (Indiana) office, or write: Standard Oil Company (Indiana), 910 South Michigan Avenue, Chicago 80, Illinois.



STANDARD OIL COMPANY

(Indiana)

What's your problem?



C. B. Eggen of the Standard Oil office in Joliet is the specialist who helped solve this press room lubrication problem for A. O. Smith Corporation.

With a broad background of practical experience and special training, his service is typical of the assistance available to plants located everywhere in the Midwest. Like others in the corps of Standard Oil lubrication specialists, he makes his headquarters near the plants he serves.

To take advantage of prompt, on-the-spot service in your own plant, phone or write the Standard Oil office in your area. When the lubrication specialist calls on you, be sure to get full information on these fine Standard Oil products:

CALUMET Viscous Lubricants—These greases strongly resist washing and throw-off. Their superior wetting ability affords better coating of open gears and chains, better internal lubrication of wire ropes.

STANORUST Rust Preventives—The eight grades of STANORUSTs form one of the most complete and effective lines of rust preventives available. Each has been scientifically developed for its intended use. The grades range from a fingerprint remover to a heavy petrolatum that protects against corrosion for years under the most severe outdoor exposure.



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"The Dustube has made our operations so much healthier and cleaner," says Mr. G. J. Wrasman, Production Manager, "that it is indispensable from the standpoint of improved working conditions." An improved purity of color in the finished paints has also resulted since contamination of one mixer by the dust of another is eliminated.

The high efficiency and low operating cost of the Dustube is improving working conditions and saving money for manufacturers in all types of industry. Whenever you have a dust problem, it will pay you to investigate the cost-saving advantages of the Dustube.

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NAMES IN THE NEWS, cont. . .

the technical laboratory at Deepwater Point. With company since 1940. Princeton graduate.

J. Davidson Pratt, C.B.E., director and secretary, Association of British Chemical Manufacturers, prominent member of the Society of Chemical Industry and the Institution of Chemical Engineers will address the Alpha Chi Sigma banquet, Prince George Hotel in New York September 4. Subsequently he will be the guest of the Manufacturing Chemists Association in New York and Washington.



J. D. Pratt



E. G. Locke

Edward G. Locke. Chief of the division of derived products, U. S. Forest Products Laboratory, Madison, Wis. Formerly chief of the forest utilization service in the Pacific Northwest Forest and Range Experiment Station, Portland, Ore. Studied at Oregon State and Ohio State. Previous positions: chemist for the Ohio State Highway Commission; assistant professor of chemical engineering at Oregon State; chemical engineer in the industrial resource development division of Bonneville Power Administration.

Richard F. Warren. Senior market research analyst, new products development department, American Cyanamid. Has been Chemical Engineering's market editor. Joined CE in 1946 after four years with the Marine Corps. RPI graduate (B.Ch.E., 1942).

Robert K. Oberteuffer. Retired as field superintendent for American Potash and Chemical Corp., Trona, Calif., after 17 years.

Madhav R. Bhagwat. Research chemist, development and research department, Hooker Electrochemical Co. Formerly with H. K. Ferguson. New chemist with the department: Jack S. Newcomer, formerly with Sharples. New chemical engineers: Adam C. Pebrinkis (engineering department); K. A. Gendron, Walter T. George (process study department).

Thomas H. McCormack

Continued from page 234

McCormack does not think that Washington is any more confusing than business, though he admits doing business within the government is much slower. "You can get a person on your staff just like that," he said, talking about normal business operations. In business you hire the man when you decide you want him, but in government you have to go through a lot of red tape to get him, he explained.

How about the day to day operations. Everyone knows that an industry man in OPS has a more difficult time of it than one serving in NPA, for example. In NPA industry knows that there is a certain amount of the scarce material that is to be allocated and it is concerned only with an equitable allocation. It gets down almost to simple mathematics. But in OPS the price and profit relations are not so simple, and there's the problem of competition.

McCormack has one inflexible rule. No industry man is ever permitted to sit in on any deliberations or discussions involving products in which he or his firm is interested. To assure impartiality, the decisions are made by government people who may ask the industry man questions, but are not permitted to entertain any suggestions or recommendations from him.

Industry representatives McCormack pointed out should discuss specific problems or cases when they come for a conference with OPS officials.

From the standpoint of furnishing personnel the industry has been very cooperative, McCormack said.

The future of OPS and its divisions depends upon what Congress will do during the next month or so. Congress will have to define the job it wants OPS to do. The present period is somewhat of a lull in operations because of the debates now going on over the Defense Production Act.

On the Friday Chemical Engineering interviewed Mr. McCormack he confirmed a date to play golf late that afternoon in Baltimore as a short stop-over en route to his home at Rose Valley, Delaware County, Pa. Waiting for him here every weekend are his wife and two children. Golf is about the only hobby he can afford to take time out for. Though he wouldn't admit it, the present lull must be a welcome relief.

William T. Dickens, Manager of Monsanto's new plastics plant at Cincinnati. With Monsanto since 1938 as: research engineer, superintendent
(Continued)

YOU
How Williams can help
improve the performance of
Automotive Priming
Coats



As you know, the life and beauty of automotive top coats depend largely on the quality of your priming coats.

Water-resistance, adhesion, hold-out, shrinkage, gloss and durability . . . these are the essential qualities of priming coats which enable enamel top coats to retain original beauty despite years of wear.

To help you obtain these qualities, Williams is prepared to supply you with iron oxide pigments CUSTOM-MADE to the requirements of your coating system. These CUSTOM-MADE pigments . . . in combination with your carefully prepared vehicles . . . can often substantially improve the performance of your primers, primer-surfacers and surfacers.

If you have a primer problem . . . now, or in the future . . . please write Dept. 3, Easton, Pa. Our technical service laboratories will gladly cooperate with you in working out a good solution.

WILLIAMS
COLORS & PIGMENTS

C. K. WILLIAMS & CO.

Easton, Penna. • Emeryville, Cal. • E. St. Louis, Ill.

108 Shades and Types of Iron Oxide Pigments

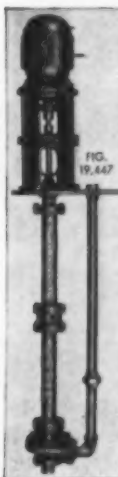


Let us put this Prater equipment in a "package" for you. Let us design your process system so that you can grind and fractionate in one continuous operation. This closed circuit plan involves the use of Prater Dual Screen Pulverizers . . . Twin Cone Fractionators . . . Heavy Duty Collectors . . . and Rotary Airlock Feeders. And for fast, uniform blending of dry materials we'll include Blue Streak Twin-Spiral Mixers. Send for complete details and free book . . . today.

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PRATER Mills • Mixers • Magnets • Pulverizers
Fractionators • Dust Collectors • Milling Equipment

TABER for Higher PRACTICAL Performance PUMPS for PROCESS INDUSTRIES



For the processing industries pumps need to be built for definite requirements. For this reason Taber Centrifugal Pumps will always prove far superior to stock or trade pumps. • For example: there is a variety of impeller combinations for given-size casings; casings of various sizes for given-size yokes; over-size ball bearings, extra size shafts; extra deep stuffing boxes — all assembled and "Performance" Rated for final requirements of your job. • This is an indication of extreme flexibility and dependability of Taber Pumps. • Also pump built of any obtainable metal or alloy found suitable by customer. • Please use business stationery when writing for Bulletin CL-339.

TABER PUMP CO. (Est. 1859) 294 Elm St., Buffalo 3, N. Y.

TABER PUMPS

NAMES IN THE NEWS, cont. . .

of cast phenolics, design engineer in the general engineering department, area supervisor then production superintendent at the Texas City plant, general superintendent then assistant plant manager of the Lustrex styrene department. Chemical engineering graduate of Yale.



J. W. Stevens



R. H. Kampschulte

J. W. Stevens. Sales manager, chemical division, Celanese; formerly director of sales, organic chemicals department. Came to Celanese in 1947 from the Calco Division of American Cyanamid. Chemistry graduate of Princeton. Assistant sales manager, organic chemicals department: R. H. Kampschulte. Formerly, eastern district sales manager. With Celanese since 1945. Chemical engineering graduate of Lehigh.

Carlton Bates. Vice president in charge of the alkali section, Solvay Process Division, Allied Chemical & Dye. Solvay history: director of operations for fifteen years; vice president since 1945. New director of operations: H. R. Margetts, with Solvay since 1918.

George T. Dib. Construction engineer with the Westvaco Chemical Division, Carteret, N. J., of the Food Machinery and Chemical Corp.

Howard F. Reeves, Jr. Director of research, Tennessee Products and Chemical Corp. Previous employers: Wyandotte Chemical Corp., Bay Chemical Co., Ethyl Corp. Graduate of Mississippi State and Louisiana State.

Joseph J. Burbage and Earl W. Gluesenkamp. Associate directors of Monsanto's central research department. Dr. Burbage continues to direct the Mound and Scioto laboratories which Monsanto is operating for the AEC. Monsanto history: joined in 1943 as research chemist; group leader; operations manager; assistant laboratory director of the Mound laboratory. Dr. Gluesenkamp: joined company in 1936 as a research chemist; group leader

since 1940. Studied at Butler University, University of Illinois, State University of Iowa and Purdue.

A. W. Fisher, Jr. Ex-Kingfish of the "Ichthyologists" (piscatorial nickname for the Boston Chapter of AIChE). New catch of officers for the 1951-52 season:

Kingfish

C. A. Stokes, director of research and development, Godfrey L. Cabot.

Mackerel

J. E. Vivian, MIT professor.

Smelt

R. Antonsen, Godfrey L. Cabot.

Shark

Peter Rinaldo, Dewey & Almy.

Martin Aaron. Vice president of American Plastics Corp. For the past three years, assistant to the president.

Frank O. Prior. Executive vice president Oil Co. (Indiana). In 1919 started with Standard subsidiary, Midwest Refining Co., progressing through engineering and production jobs. President of Stanolind Oil and Gas, 1930. Vice president and director of Standard, 1945. Stanford graduate.

I. M. LeBaron. Director of research laboratories, International Minerals & Chemical Corp. Has been a research engineer with the company since 1942. Previously, research engineer for Aluminum Co. of America. Studied chemical engineering at Syracuse University, Rhode Island State College, Colorado School of Mines. Taught at Rhode Island State, NYU, Louisiana State University, Colorado School of Mines. His successor as research engineer: **W. C. Knopf.**



I. M. LeBaron

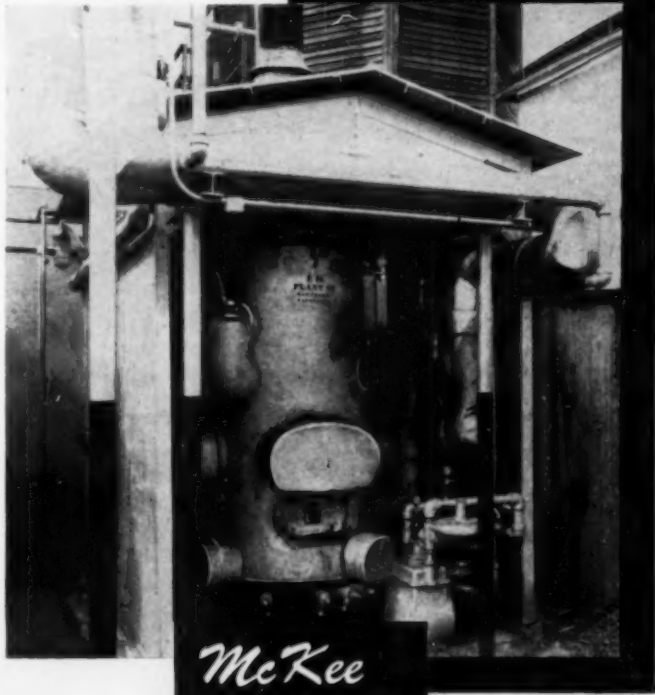


J. Mair

James Mair. Granted the professional degree of chemical engineer by the University of Alabama's department of chemical engineering for his developments in the design of evaporators. Vice president of Goslin-Birmingham Mfg. Co., Birmingham, Ala.

John W. Maloney. From deputy director to director of the pulp, paper and paperboard division, NPA. On (Continued)

MOTOR OIL IS GETTING BETTER ALL THE TIME



...thanks to

900,000 BTU Gas-Fired McKee Dowtherm Vaporizer in western refinery research project.

in Refinery Research Programs

Petroleum products are constantly being improved and one type of processing equipment that is playing an important role in this development is McKee Dowtherm Vaporizers which make possible close, uniform temperature control.

Your process heating problems may be far removed from oil research; but, if they involve heat processing, it will pay you to investigate versatile McKee Dowtherm Vaporizers.

They are now being employed successfully in a wide variety of melting, cooking, deodorizing and other heating applications.

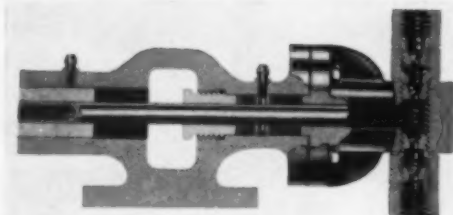
REPRESENTATIVES IN ALL PRINCIPAL CITIES

Eclipse Fuel Engineering Company
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McKee
Eclipse

THE MOST COMPLETE LINE OF GAS-FIRED EQUIPMENT ON THE MARKET

Here . . the "INSIDE STORY"



Neptune

CHEMICAL APPORTIONING PUMP

For Continuous Chemical Feeding

A view of the components—the *vitals*—gives some idea of what the creative Neptune engineers have achieved in this modern, streamlined pump that is outstanding in the field of chemical feeding.

There are not two, but *four* stainless steel, spring-loaded ball valves. Other features provide for even distribution of pressure for packing take-up . . . constant lubrication . . .

simplified packing replacement . . . the "self-adjusting" universal joint . . . an extra-strong cast iron base for the complete assembly.

Above all, the Neptune Pump is noteworthy for its *simplicity of design and fewer parts*. Severe tests have proved its ruggedness . . . its readiness to give years of uninterrupted service without costly servicing and production delays.

NEPTUNE PUMP MFG. CO. 4912 N. 6th Street
Philadelphia 20, Pa.

SPRACO NOZZLES

Write for NOZZLE CATALOG to
SPRAY ENGINEERING CO.
115 CENTRAL STREET • SOMERVILLE 45, MASS.

NAMES IN THE NEWS, cont. . .

leave as vice president of the Hoberg Paper Mills, Green Bay, Wis.

H. W. Fleming. Member of the research and development department, Girdler Corp., Louisville, Ky. To direct expanding catalyst development program. Formerly group leader in Phillips Petroleum's research and development department. Studied at Kenyon College and Western Reserve.



H. W. Fleming



C. L. Campbell

Charles L. Campbell. Chief engineer, Centrifex Corp., Cleveland. To direct design development of purifying equipment. Previously with: West Virginia Pulp & Paper, Barium Reduction, and most recently, Diamond Alkali. Studied at MIT; City College, London; Le Sorbonne, Paris.

H. V. Churchill. Retired chief of the analytical division, research laboratories, Aluminum Co. of America. With Alcoa since 1919. His successor: his son, J. R. Churchill who has been his assistant since 1944.

Francis Burr. To assist in resin control and development, Burlington Mills, Greensboro, N. C. Formerly manager of technical service, textile chemical department, Monsanto.

Howard A. Gray. Group leader in the textile chemical research laboratory, Monsanto's Merrimac Division, Everett, Mass. With Monsanto since 1935. Graduate of Northeastern. His successor as administrative assistant in the research department: William R. James.

Julien Paul. Assistant product manager, fine chemicals department, Carbide and Carbon Chemicals Co. With Carbide for 15 years in the pilot products plant, process development laboratory, and most recently with the foreign department.

Robert D. Buzzee. Buyer, plastics division, GE's chemical department. Formerly manufacturing engineer
(Continued)

IN TIMES LIKE THESE...

Where pipes
meet permanently...



YOU NEED

WATSON-STILLMAN

FORGED STEEL

SCREWED AND SOCKET-WELD FITTINGS



SCREWED FITTINGS... are designed with simple axial sections. The wall thickness is faithfully observed in final manufacture. Extra long bands extend well beyond the last thread, providing reinforcement at points of severest strain. Threading — is long, accurately cut, and perfectly aligned to insure tight joints. All fittings are properly chambered to protect thread and afford easy entrance of the pipe.

SOCKET-WELD FITTINGS... just slip over end of pipe and weld. Deep socket supports and align pipe, eliminates tack welding and the use of special fixtures. Accurate measuring and cutting of pipe unnecessary... Angle come and go. No welding inside inside pipe — an oblong flange. Wall section 1 1/4 times the nominal pipe thickness permits proper heat penetration and extremely proportioned fillet weld.

Basic materials are selected from a wide range of carbon, stainless and alloy steels. Drop forging and precision machining makes them light in weight, assures accuracy of finish, and all are inspected for perfection of threads, surfaces, angles and concentricity. Write for Bulletin AS-20 for information on Stainless and Alloy Steel Fittings, Bulletin S-1.

DISTRIBUTOR PRODUCTS DIVISION **WATSON-STILLMAN** ESTABLISHED 1848 • ROSELLE, NEW JERSEY

Designers and Manufacturers of Forged Steel Fittings, Valves, Wire Rope Shears,
Hand Pumps, Jacks, Pipe Benders and Hydraulic Equipment

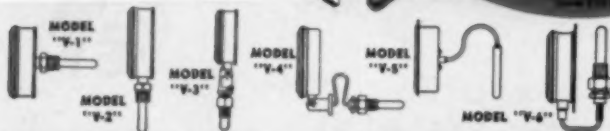
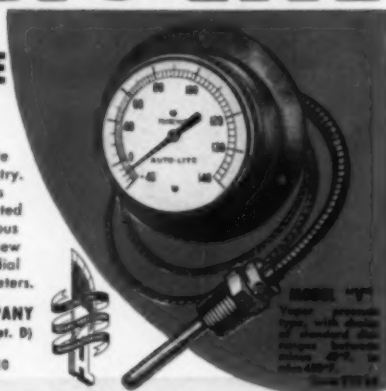
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AUTO-LITE

for TEMPERATURE INDICATION

Model "V" is one of many Auto-Lite dial thermometers made for industry. The outline drawings show how this temperature indicator can be adapted to meet specific needs through various standard mountings. Send for our new Catalog No. G-143-B of Auto-Lite dial indicating and recording thermometers.

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INSTRUMENT AND GAUGE DIVISION (Dept. D)
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BULLETIN 551—Just off the press will give you factual information on Paint, Varnish and Lacquer installations for cooking, mixing and handling applications.

Write for your copy today!

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P.O. Box 502, Roosevelt Annex
Detroit 32, Michigan



SCHNEIBLE

NAMES IN THE NEWS, cont. . .

in the mold manufacture section. With GE since 1941. Graduate in chemistry of Massachusetts State College.

Marjorie T. Hoel and Elmer A. Schaefer. Junior research chemists in the Hilton-Davis laboratories. Mrs. Hoel: graduate in organic chemistry from Connecticut Wesleyan College; three years as associate editor of three sections of *Chemical Abstracts*. Mr. Schaefer: chemistry graduate of the University of Cincinnati.

Frank D. Maslan. To head Army-sponsored project covering studies of the physical and chemical properties of TNT waste water at NYU's college of engineering. Assistant professor of chemical engineering at NYU.

William H. Ward, a vice president and member of the executive committee's board of directors, E. I. du Pont de Nemours & Co., has just been re-elected vice chairman of the Manufacturing Chemists Association.



W. H. Ward

Mr. Ward started with Du Pont in 1915 after his graduation from Swarthmore. His first job was as a chemist at the Explosives Department's Eastern Laboratory at Gibbstown, N. J. He came to Wilmington as assistant to the chemical director of the department in 1923. In 1930 he became assistant director of sales; director of sales in 1933; general manager of the department in 1944. It was under his direction that important military work undertaken by Du Pont for the government was carried out during World War II. He was elected to his present posts in 1947.

He was born in 1892 in Barnesville, Ohio. He attended the town's public schools and Swarthmore College, graduating with a B.A. in chemistry. At college he was member of the track team, glee club and student government.

In 1920 he married Sophie Helene Hodges. They now live in Swarthmore, Pa.

John W. Rutland. General manager of the plant food division, International Minerals & Chemical Corp. With the company for 30 years. His successor as sales manager of the division: Joe F. Stough.

Robert M. Chesney. Manager of Deep Rock Oil Corp.'s refinery at Cushing, Okla. Had been with Socony-Vacuum since 1934: chemist, assistant foreman and process engi-

neer, foreman, process supervisor, assistant to the general manager, assistant refinery superintendent, superintendent at Paulsboro, N. J., refinery. Graduate in chemical engineering of the University of Delaware.

Myron T. Fleming. Vice president in charge of sales and engineering for the dryer division, Proctor & Schwartz. With company since 1935, most recently as sales manager. Graduate of Drexel Institute.

S. C. Hollister. Member of the Committee on Specialized Personnel, Office of Defense Mobilization. Dean of the college of engineering, Cornell. Newly elected president of ASEE.

Edward F. Degering. Research manager, Buckman Laboratories. Has been professor of chemistry at Purdue since 1930. On leave for the last two years for special research at Armour Research Foundation and Miner Laboratories.

OBITUARIES

Constant A. Benoit Sr., founder and president of Permatex Co., Brooklyn, died May 17. He was also director of chemical research of the company.

Warren Emley, 65, former chief of the division of organic and fibrous materials, Bureau of Standards, died June 5 in New Brunswick, N. J. He had taught chemistry at New Jersey College for Women since 1945.

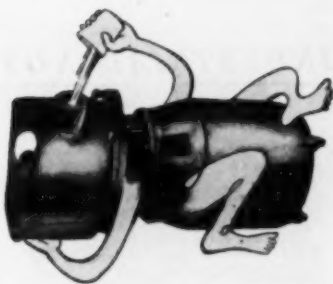
John M. Hopwood, 67, chairman of the board of the Hagan Corp. and its subsidiaries, died in Vero Beach, Fla., June 8.

Theodore E. Fullmer, 55, vice president and director of Clorox Chemical Co., died in Charlotte, N. C., June 23. He had been with the firm and its predecessors since 1918. He was elected vice president in charge of production in 1941.

Mark Morton, 92, died in West Chicago June 25. He and his brother established Morton Salt Co. in 1902. Mr. Morton served as vice president and director until his retirement 20 years ago.

Joseph P. Maider, 64, production manager of the Goodyear Tire & Rubber Co.'s chemical production department, died June 27.

—End



ONLY new Goulds Self-Priming Pumps

Give ALL 5 Important Advantages

- 1. Absolutely no valves**—There are no valves of any kind in these pumps—nor are any needed in installation. Liquid can drain out of discharge and suction line through pump without affecting priming ability.
- 2. No recirculation**—Liquid does not recirculate after completion of priming action.
- 3. Top-notch efficiencies**—Efficiencies

in these pumps are comparable to quality straight centrifugal pumps.

- 4. Positive fast-acting self-priming**—Self-priming is similar to priming ability of positive displacement pumps.

- 5. Small compact priming chambers**—No large or bulky priming chambers mean small, compact units at low cost.

SELECT THE PUMP YOU NEED FROM THIS COMPLETE LINE

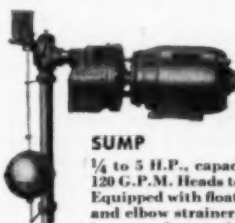


INDUSTRIAL

$\frac{1}{4}$ to 5 H.P. ratings, open and closed impellers. Capacities to 120 G.P.M. Heads to 135 ft., suction lifts to 25 ft. Flexible coupling, or close-cupid motor drive. Send for Bulletin 636.1.

PORTABLE

Compact, lightweight, with gasoline engine. Capacities to 58 G.P.M. Heads to 25 ft. Send for Bulletin 639.1.



SUMP

$\frac{1}{4}$ to 5 H.P., capacities to 120 G.P.M. Heads to 135 ft. Equipped with float switch and elbow strainer. Pump is not submerged in pit. Send for Bulletin 627.

GASOLINE ENGINE DRIVEN

$\frac{1}{2}$ to 5 H.P., open and closed impellers. Capacities and heads same as Industrial. Available in close cupid only. Send for Bulletin 638.1



For complete information contact your nearest Goulds representative or write Pump Headquarters, Seneca Falls, N. Y.



PUMPS INC.

Seneca Falls
New York

INDUSTRIAL NOTES

NEW FACILITIES



Calumet and Hecla Consolidated Copper Co., Calumet, Mich.—A research center for its Calumet Division. The new building houses laboratories for chemistry, metallurgy, agricultural chemicals and new product development. George L. Craig continues in charge of the company's research program.



Nox-Rust Chemical Corp.—A plant in Chicago for rust-preventive products and petroleum chemicals. It will contain laboratories, offices, storage tanks for raw materials and a steam plant as well as the manufacturing facilities proper. Soon after it begins operating early this fall, the company's production will increase by 50 percent.

Robinson Clay Products Co., Akron, Ohio—An over-all plant expansion program to keep its production up to the demands of the defense industries. A World War I plant in Malvern, Ohio, has been reactivated to make clay pipe.

Crane Packing Co., Chicago—A new plant in Morton Grove, Ill., to make industrial packings, mechanical seals, oil seals and a newly developed precision lapping machine.

Hammond Bag and Paper Co., Wellsburg, W. Va.—A multiwall paper bag plant at Pine Bluff, Ark. The \$300,000 project will replace the company's present Pine Bluff facilities which the Chemical Corps of the Army is taking over in September.

Inflico Inc.—A research and development building at its new headquarters in Tucson, Ariz. Work in the water conditioning, sewage disposal and waste treatment fields will be conducted there.

Kennametal Inc.—A plant at Bedford, Pa., for its machine tool fabricating division, now located at the main plant at Latrobe, Pa. The move will provide room at the main plant for increased production of Kentanium, a new heat-resistant titanium carbide.

Santa Anita Chemical Corp., Arcadia—Equipment for custom fabrication of flexible molds, basically vinyl elastomers, for the casting of plaster, plastics, waxes, low melting point alloys.

Standard Oil Co. (Indiana)—A catalytic cracking unit and an alkylation unit at Neodesha, Kan., to permit production of high quality motor gasoline and high octane aviation gasoline components. Operation will begin by the end of 1952.

California Spray Chemical Corp., Richmond, Calif.—A northern California branch to be handled by Virgil Goldman.

Toronto Elevators Ltd., Toronto—A 150-ton-a-day soybean extraction plant, now being designed by Blaw-Knox.

General Controls Co., Glendale, Calif.—Five new branch offices: Salt Lake City, El Paso, Omaha, Milwaukee, New Orleans.

International Cross Arm Co.—A \$75,000 wood preservative plant at Bellingham, Wash., making possible the production of 2,500 treated cross arms a day.

Glidden Co., Cleveland—A \$700,000 expansion in plant capacity for Alpha Protein, a soybean derivative which is used as an adhesive for weather-proof fiber boxes.

Insul-Mastic Corp. of America, Pittsburgh, Pa.—A West Coast branch headed by George A. Bulmer. Headquarters will be in Los Angeles.

Atlas Chemical Co., Waynesboro, Ga.—An increase in plant capacity of 500 tons of insecticides a month.

Raymond C. Crippen, Research and Development Laboratories, Baltimore—A silicone laboratory to study methods of preparation, analysis,

testing, uses and applications. Facilities have also been expanded for organic chemical analyses, research, development and small scale organic syntheses.

Tennessee Products and Chemical Corp.—A \$1.5 million expansion in its furnace operations at its Alton Park plant, Chattanooga, Tenn.

Rockwell Mfg. Co., Pittsburgh, Pa.—A plant and service depot in Tupelo, Miss., to be opened in September.

H. M. Harper Co.—An addition to its non-ferrous and stainless steel fastenings plant in Morton Grove, Ill. It will house complete facilities for the reduction of copper, nickel, aluminum and stainless steel wire and bar stock.

Lee Rubber & Tire Corp., Youngstown, Ohio—A \$1.8 million plant addition for its Republic Rubber Division to house production of wire and textile braided, mandrel built, lead press cured hose.

NEW LINES

Airetool Mfg. Co., Springfield, Ohio—Complete assortment of tube cleaners and expanders for chemical and refinery use through the acquisition of Ajax Expander Co., Fairview, Pa.

Baldwin-Hill Co., Trenton, N. J.—Insulating blankets, felts, insulating cements, pipe covering, fill insulation and board and block insulation. A new company division, formed since the purchase of the Tex-Rock Insulation Mfg. Co., will manufacture these products.

NEW LOCATIONS

Worthington Pump and Machinery Corp. has moved the sales and engineering functions of its water treating section to its Harrison, N. J. plant.

Uniform Tubes, manufacturer of small precision tubing, has moved to its new plant in Collegeville, Pa.

Kuljian Corp., Philadelphia, has moved its Washington offices to larger quarters at 1832 K St. N. W. (Continued)



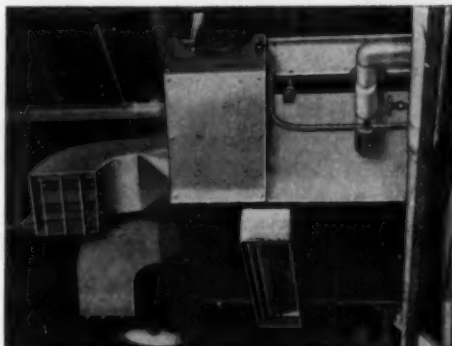
Settle Next Winter's
HEATING PROBLEMS Now!

INSTALL



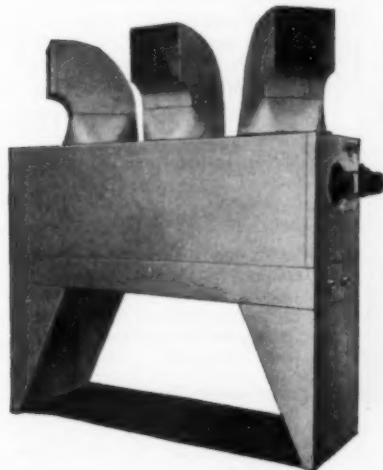
**Quick Heat
For Small Areas!**

Plan now to wipe out any chilly areas that cramped production last winter. "Buffalo" Breeze-Fin Heaters are very easily installed in suspended position. They operate efficiently on as little as 2 lbs. steam—are available in 20 sizes—have quality Aerofin heater element for maximum radiation and "Buffalo" Breeze Fan for positive heat throw. Now is the time to write for Bulletin 3137-D for the facts!



**Up and Out
Of the Way!**

Another space-saver is the Suspended "Buffalo" Lowboy Heater, here supplying fresh, filtered, heated air to an entire room. As a window installation this unit is ideal in supplying makeup air for plants using large-capacity exhaust systems. Unit has high-efficiency non-corrosive Aerofin heater element and "Buffalo" mixed-flow fans on hollow shaft.



To Heat Large Floor Areas!

The compact Highboy Heater, with readily adjustable outlets for louvers or duct connection, is simple to install as are all "Buffalo" Unit Heaters. Unit shown is equipped with by-pass damper and the same efficient coils and fans as the Lowboy above. Arrangements and combinations to fit *your* layout. Plan now for next winter—write for Bulletin 3704!

BUFFALO *Buffalo* **FORGE COMPANY**
501 BROADWAY
Canadian Blower & Forge Co., Ltd., Kitchener, Ont. **BUFFALO, N. Y.**
Branch offices in all Principal Cities

VENTILATING
FORCED DRAFT

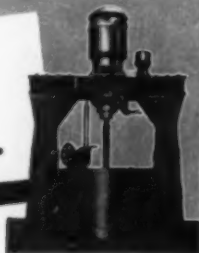
AIR WASHING
COOLING

AIR TEMPERING
HEATING

INDUCED DRAFT
PRESSURE BLOWING

EXHAUSTING

Get greater
daily output...



with *Fletcher* High-speed Centrifugals

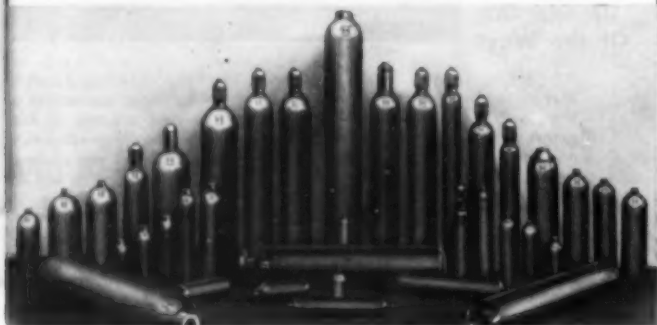
The Fletcher not only provides highest running speed, but also speed in acceleration which brings the basket quickly to maximum efficiency. Rapid braking cuts lost time between drying and discharging. Unloading, too, is accomplished quickly. These high-speed features combine to assure greater production... most economical centrifuging. Send for a copy of our catalog on Fletcher Centrifugals for the Chemical Industry. It gives full details.

FLETCHER CENTRIFUGALS

FLETCHER WORKS, 235 GLENWOOD AVE., PHILADELPHIA 48, PA.

HERE'S YOUR BEST BUY

... in seamless steel cylinders for high-pressure gases



HARRISBURG manufactures a complete line for the storage and transportation of fixed, liquid, and medical gases. Sizes, capacities, and types for every purpose, made to I.C.C. specifications, in Domestic and Export lines. Give your cylinder problem to Harrisburg.

FIXED GASES

helium, hydrogen,
nitrogen, oxygen

LIQUID GASES

carbon dioxide, chlorine

MEDICAL GASES

carbon dioxide, cyclopropane, ethylene, helium, nitrous oxide, oxygen

**HARRISBURG
STEEL CORPORATION**



Custom-Built Quality Products in Quantity
98 YEARS IN PENNSYLVANIA'S CAPITAL

Harrisburg 16, Pennsylvania

INDUSTRIAL NOTES, cont. . .

Austin Co., engineers and builders, has moved its eastern district offices to the new 600 Fifth Ave. Bldg., New York.

NEW COMPANIES

Carolina Soap Co., Pinchurst, N. C., to produce toilet soap products.

Wilson Meyer Co., San Francisco, to handle sales and distribution of Eastman Kodak's industrial chemicals in the western states.

W. E. Major & Co., San Francisco, to act as manufacturers' agents dealing in heavy chemicals. W. E. Major, head of the concern, was for many years West Coast manager of Allied Chemical & Dye Corp., general chemical division. In recent years, he has acted as agent for Kaiser Steel Corp. (coal tar chemicals), and Wilson Carbon Co.

NEW NAMES

Geo. C. Gordon Chemical Co., Kansas City, Mo., has changed its name to Gordon Chemical Co. The company is now headed by Kenneth J. Stephany and H. S. Bunting who have purchased it from its founder, George C. Gordon.

Platen Products Co., Hazel Park, Mich., has changed its company name to Periflex, Inc., to coincide with the name of its packings.

NEW REPRESENTATIVES

Wheelco Instruments Co. has appointed Engineering Products Co., Charleston, its representative for the State of West Virginia.

Worthington Pump and Machinery Corp., Harrison, N. J., has appointed Oficina Tecnica Armando Capriles C. A. to distribute its air conditioning and refrigeration line in Caracas, Venezuela.

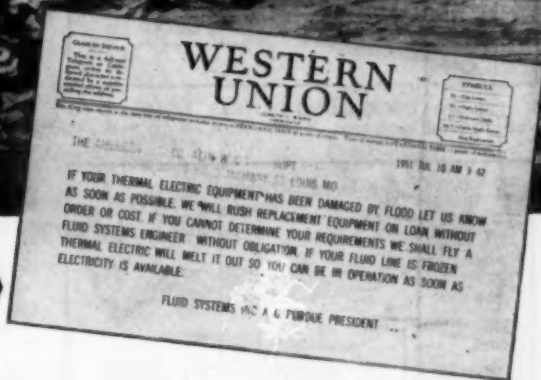
Owens-Corning Fiberglas Corp., Toledo, has appointed Melcor Industries, Waterville, Ohio, fabricator-distributor of a new Fiberglas-insulated corrugated container in which frozen foods may be stored and carried up to 12 hr. without refrigeration.

Warren Steam Pump Co., Warren, Mass., has appointed Process Industries Engineers' Rochester office to handle its products in upstate New York.

(Continued)

DISASTER..

This is the telegram which Fluid Systems, Inc. sent to all Thermal Electric users in the KANSAS-MISSOURI FLOOD AREA . . .



Just picture this: As flood waters began to rise, Thermal Electric users did not have to maintain steam in the face of impossible difficulties to prevent freeze-up of their wax, asphalt or other fluid lines. They did not have to remember to drain them, with a thousand other simultaneous problems demanding their attention.

Afterward, they did not have to disassemble or re-erect their fluid transport. They just hooked another Thermal Electric Transforming Energizer to the pipe, and production proceeded while Fluid Systems Engineers dried out the flood-soaked unit for re-installation.

Where a Thermal Electric Standard System is part of the oil burning layout, steam becomes available immediately for drying out the premises and for essential services. Thermal Electric melts the bunker fuel in the pipes and in storage. If old fashioned steam systems had been used, waterlogged remote pump-sets could not have maintained constant circulation and no steam could have been available for days to heat the fuel. Thermal Electric

provides immediate operation as soon as the flood recedes.

Thermal Electric's flexible equipment design permits us to furnish disaster replacements immediately from stock.

Thermal Electric has helped in many disasters. Thermal Electric was used in restoring service to Southern New England Telephone Company, New England Telephone and Telegraph Company, United Illuminating Company, and many companies along the Atlantic Seaboard after two devastating hurricanes.

In the Kansas-Missouri flood area, Thermal Electric speeded the return of service for—

Owens-Corning Fiberglas Corp.
915° of 375°F. asphalt transfer

American Can Company
140° of 425°F. asphalt transfer

Blanke-Baer Extract and Pre-serving Company

Eden Seminary

Marillac Seminary

Stephens College

Enterprise Cleaning Company

Sears-Roebuck and Company

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Fluoride Scrubbers

In the acidulation of phosphate rock to produce superphosphate, silicon tetrafluoride is evolved. It must be controlled because of health and well-being considerations of both employees and residents of the community.

A. B. Pettit

Cuts at the left show the three types of scrubber. It is important to note that almost the entire evolution of fluorides occurs within the mixer and in the den.

WATER SPRAY SCRUBBING TOWERS

Fig. 1 is a flowsheet of a water-spray scrubbing tower system used in one plant. It consists of two cylindrical, vertical towers, 42 in. in diameter by 40 in. high and another 42 in. in diameter by 20 in. high, surrounded by a sump. Construction is of untreated cypress wood. The first two towers are each fitted with six Monel spray nozzles, pointed countercurrent to the direction of gas flow, whereas the third tower contains no sprays. Each nozzle fitting is connected to the exterior piping by a short piece of rubber hose, which arrangement makes possible rapid inspection and cleaning of the nozzles while the equipment is in operation. River water, at the rate of 292 gpm., is delivered to the sprays at 32 psi. Gases are withdrawn from the mixer, 15-ton den and elevator at 13,000 cfm. Gases enter the top of the first tower, travel downward and pass to the bottom of the second tower. They then travel upward and cross to the top of the third tower. They are withdrawn near the bottom of the third tower and delivered by a fan to the stack. The fan has a cast steel spider and plywood blades attached with Monel bolts. There is some very dilute acid entrainment in the exit gases, but this is precipitated within the shadow of the stack and does not leave the plant grounds.

Liquid and solid effluents from the sump pass into a lime box where they are neutralized, and the solids are precipitated. Neutralized liquids flow into the river. The frequency with which solids must be removed and the limestone replaced varies directly with the volume of production.

The apparent average efficiency is 95 percent.

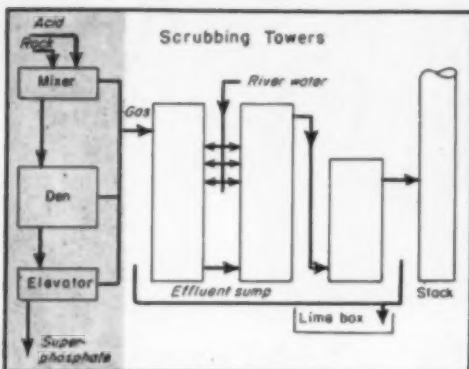
SCHUTTE & KOERTING FUME SCRUBBER

Fig. 2 is a flowsheet of a plant using a Schutte & Koerting Fume Scrubber. This unit was installed about three years ago to replace water-spray scrubbing towers, which were of insufficient capacity.

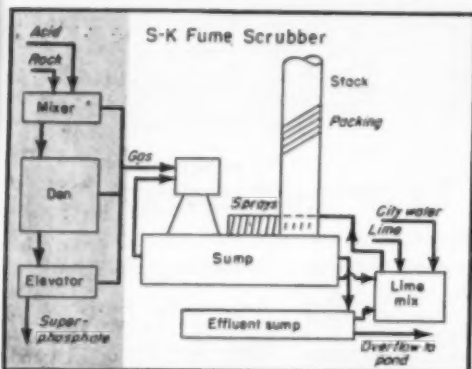
The S & K Fume Scrubber is of steel plate construction with cast iron nozzle assembly, having a 30 in. water connection. Nozzle opening is 30 cm. The unit is lined with Neoprene of the following thickness: upper chamber $\frac{1}{8}$ in., throat $\frac{1}{4}$ in., lower leg $\frac{1}{8}$ in. Nozzles and flanges are covered with $\frac{1}{8}$ in. Neoprene.

The scrubber is mounted vertically and discharges into a horizontal concrete sump fitted with a wooden cover. Twenty spray nozzles are mounted in the top of the sump and four are mounted in the base of the stack, all are pointed downward. Spray nozzles are of stainless steel.

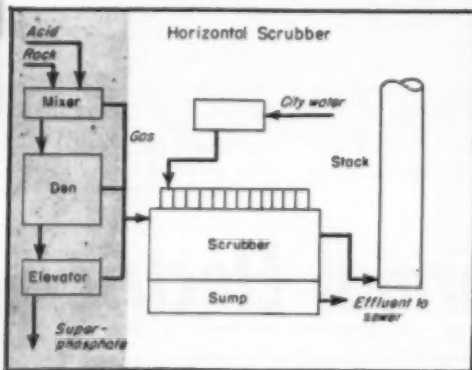
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WATER SPRAY SCRUBBING TOWERS. Efficiency 95 percent. Frequent inspections. Washed down twice a week.



SCHUTTE & KOERTING FUME SCRUBBER. Efficiency 95+ percent. Frequent inspections. Cleaned every 240 hrs.



WATER SPRAY HORIZONTAL SCRUBBER. Efficiency 99+ percent. Unit washed down every 2 1/2 days.



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CHEMICAL ENGINEERING—August 1951



QED, cont. . .

Each is individually valved at exterior pipe connections and is connected thereto by a short piece of rubber hose which permits inspection and cleaning while the unit is in operation.

To prevent entrainment of hydrofluosilicic acid, there are 17, 2 by 10 by 30-in. baffles in the base of the stack. In the stack, a short distance above these, there is a two-layer bed of 1-in. Raschig rings fitted into a drawer which permits easy withdrawal of the bed for cleaning. A thicker bed was tried, but the pressure drop was greater than could be taken by the system; however, the two-layer bed has proved to be adequate.

All scrubber piping is standard brass. All wood and steel surfaces which would be exposed to fluosilicic acid, either directly or indirectly, were sprayed with a $\frac{1}{8}$ in. coating of Fendix.

Liquids from the scrubber sump flow to an effluent sump 12 ft. square and 8 ft. deep. Liquids from the effluent sump are pumped to a "lime-mix" tank where they are mixed with city water make-up and lime, which is added automatically in an amount predetermined to be adequate to neutralize all fluorides. Agitation is accomplished by air sparger pipes. Water, at 60 gpm. and 30 psi. is pumped from the lime-mix tank to the 24 spray nozzles. 300 gpm. of water at 60 psi. is pumped from the scrubber sump to the S & K unit. 500 gph. of effluent liquids and solids are run off from the effluent sump to a settling pond where there is sufficient natural evaporation to avoid the necessity of providing a run-off from the pond.

Gases are withdrawn from the mixer, 15-ton den, cutter and elevator at 7,500 cfm., through the S & K Fume Scrubber and past the 24 sprays.

The apparent average efficiency is greater than 98 percent.

WATER SPRAY HORIZONTAL SCRUBBER

Fig. 3 is a flowsheet of a plant using a water spray horizontal scrubbing system which was installed a little over four years ago. This is a wooden, box-like structure 33 ft. 3½ in. long, 4 ft. 9½ in. wide and 11 ft. 10 in. high. It sets in a concrete sump 2 ft. deep and 2 ft. wider than the scrubber. The scrubber is divided by baffles into 11 compartments, each slightly less than 3 ft. long, inside dimensions.

Except for the fan housing, which is cypress, the scrubber is constructed of long leaf, yellow pine. All wood for the scrubber was pre-dipped in Quigley's Triple "A." Wood for the

ducts was painted two coats with Triple "A." Ten of the compartments contain eight brass spray nozzles each. Each set of eight spray nozzles is connected to the exterior piping by a rubber hose to facilitate inspection and cleaning of nozzles. The eleventh compartment, which is the last one through which the gases pass, has no sprays. Negative pressure is maintained by two fans, one located before the scrubber and one between the scrubber and the stack.

City water at 60 gpm. and 62 psi. is fed to the 80 spray nozzles. Gas at a maximum rate of 14,000 cfm. is drawn from the mixer, 40-ton den, cutter,

and elevator and enters the bottom of the first chamber, passes upward and enters the top of the second chamber. It continues this alternate up and down flow through the 11 chambers and is then discharged through the stack.

Liquid and solid effluents from the sump enter a concrete sewer where they are mixed with neutralizing effluents from other sources.

The apparent average efficiency is greater than 99 percent.

A. B. Pettit, Davison Chemical Corp., before the Air Pollution and Smoke Prevention Association of America, Roanoke, May 8, 1951.

Research: Risks and Return

A symposium based on selected papers from the Fourth Annual Conference on the Administration of Research. Calculated risk; measuring the return from research, qualifications of a research executive, etc.

Does It Pay?

There are a number of ways by which we may judge the value of research. The simplest of these is to note the growth of research organizations in the United States. In 1900 formal research was practically nonexistent, but World War I demonstrated such potential value of science that by 1920 there were 300 industrial research laboratories employing about 7,000 scientists and spending \$30 million a year. In 1950 there were ten times as many laboratories as there were in 1920, about 20 times as many people engaged in research, and the expenditures were 30 times as much, or nearly \$1 billion.

Another measure of the value of research is in the industries which have grown out of its findings and in the jobs which have been created by its application. Consider a list of 1,700 of our industrial companies. Nearly one-half of these were either non-existent or were infants in 1900—aircraft, automobiles, chemicals, electrical equipment, petroleum, and rubber.

During a period of seven years, one oil company showed annual results ranging from a profit of \$1.45 to a loss of \$0.25 on each research dollar, with a seven-year average profit of \$1.35 per dollar expended on research. Another oil company estimated a yield of \$15.40 for each dollar of research expense. This sum consisted of \$3.70 savings in royalties which would otherwise have been paid to outside groups, \$9.60 for profits resulting from process and product improvements, \$2.10 for

profits from new products. In one typical year, a paper company estimated a net return of about \$10 for each research dollar used in producing that amount.

In the ultimate analysis posterity will judge research not alone by the dollar sign, nor by the great industries research has created, nor by our improved material standard of living. Profit is the immediate and essential incentive for industrial research, but there are far broader considerations than this. The findings of research may be applied in making fibers to clothe us, or to produce a deadly form of warfare; a drug may be used to heal the sick or to inflict pain on the healthy. Atomic fission, born in the stress of war and first applied to the destruction of human life, may become the greatest benefactor of mankind.

—Allen Abrams, Marathon Corp.

The Calculated Risk Factor

When considering the calculated risk of a research venture, one of the most important questions is this: What will be the effect of the project on the financial health of the company undertaking the project? What will be the return from this research?

There are many general criteria for judging the suitability of a project. Among these are: Is the project one which will lead to a product in our field of business? Do we have competent manpower and equipment to do the job? Do we have a unique or good raw material situation? How

(Continued)

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CHECK ADAPTABILITY TO SERVICE CONDITIONS

The second factor — and one you can't always predetermine by laboratory test — is on-the-job performance. That's governed, in turn, by the kind of metal you're protecting . . . the condition of the surfaces . . . how the equipment is constructed . . . conditions encountered during its operating cycle . . . during idle periods — considerations that must be surveyed in detail before you can select a protective coating with reasonable assurance it will successfully meet your requirements.

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QED, cont. . .

much investment will it require? What kind of a return can we expect on that investment? Will the product create new markets or will it enter into a market which is currently of sufficient expansiveness to absorb the new material? The answer to these and many other similar questions add up to a composite answer to the question: Is it good for the health of the organization?— Thomas H. Vaughn, Wyandotte Chemical Corp.

Realistic Cost Estimates

Estimate costs are subject to a lot of variation, depending on whether you are an optimist, a pessimist, or a realist. I suppose most research supervisors have had the experience at one time or another of seeing an otherwise attractive research development go out the window because of engineering estimates of high investment costs. If the estimates are realistic, as they should be, a reliable appraisal of the project is obtained. On the other hand, if the engineering group, responsible for making the plant estimates, employs an unduly high safety factor in order to insure that the actual costs of construction will always be comfortably below the estimated costs, you may come up with an investment figure which turns the project down.

That is one of our toughest problems. Estimates are normally based upon partial layout of a plant by an engineer who has had a lot of experience in "guesstimating," and we use his figures just as though we believed they were correct. The engineer shouldn't try to shade his figures either high or low, but whenever he foresees trouble, he should take it into consideration and take the most expensive way out. For example, if the question of using steel or stainless steel comes up he should figure on the use of stainless steel, thus putting in a possible cushion. —R. L. Doan, Phillips Petroleum Co.

Today, in our troubled world situation, there is one other type of calculated risk which the director of research must definitely consider, namely, how a project which he has underway fits into the over-all planning of the nation, as he sees it. And here I might add that "as he sees it" is a very important phrase. An important part of the job of a director of research today is making every effort to be sure that he sees it right. He must be informed on both national and international affairs and must be in definite rapport with the changing events about us. His ability to in-

(Continued)

how to prevent the wrong reaction



...the Versenes*

VERSENE* — THE OUNCE OF PREVENTION

The wrong reaction in chemical processes always spells trouble with a capital "T." This kind of trouble is always expensive. It creates confusion, costs money, wastes time, spoils goods, reduces yields, loses business and wipes out good will. The intelligent use of one or more of the Versenes can *prevent* wrong reactions caused by certain things such as metallic impurities or contaminants in commercial grade chemicals and equipment.

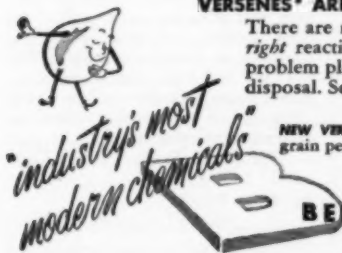
HOW THE VERSENES* WORK

The Versenes are the tetra sodium salts of ethylene diamine tetra acetic acid and other polyamino acids. They are among the most versatile and powerful chelating (complexing) agents known. They complex any di- or tri-valent metallic ions efficiently and economically and are completely stable in hot alkaline and acid solutions. The Versenes react with most metallic ions to form soluble non-ionic metal chelate compounds. These powerful, complex compounds inactivate the metallic ions so completely that they cannot be precipitated by common precipitating agents. 500 grams of dry, or 1500 grams of liquid Versene will complex one mole of metallic ions.

VERSENES* ARE AVAILABLE

There are now 7 Versenes. Each has special applications but all help give the *right* reaction every time — despite metallic contaminations. A clue to your problem places a generation of experience in pioneering the polyamines at your disposal. Send for Technical Bulletin #2. Samples on request. Write Dept. B.

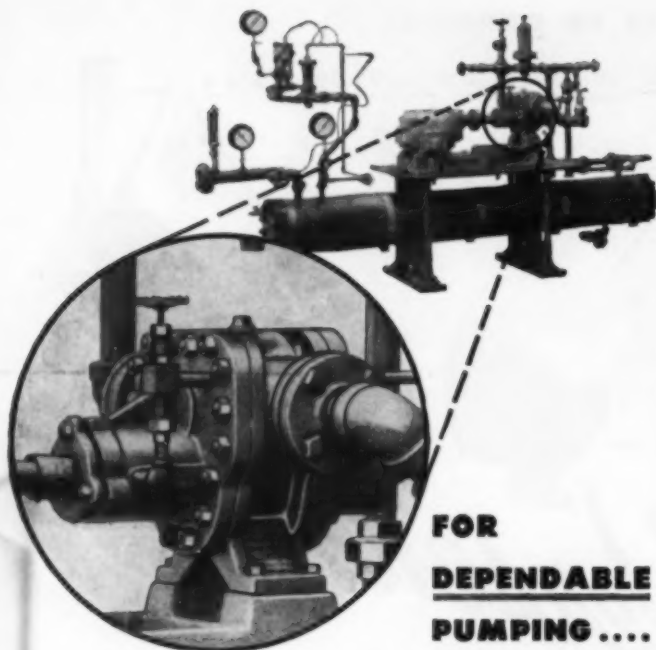
NEW VERSENE WATER TEST KIT. Tells total hardness in 2 minutes. Accurate to one grain per gallon. Versenate Method. Complete Kit \$5.00 postpaid.



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QED, cont. . .

terpret may make the difference between success and total failure in keeping his research organization in business.—Thomas H. Vaughn.

Basic Research?

In our organization, and I think this is true in many others, any man has some opportunity to explore ideas that he believes may have some ultimate benefit to our business. We do not sponsor deliberately and formally any so-called fundamental research work which has no possible application in our business, but we do some of that kind of research in the early periods of some projects.

The men in the laboratory should be able to spend some time, if they so desire, on a project without it being officially on the program.

In general, however, we try to keep such work within the confines of the area in which we are interested, etc.

Some companies have adopted a percentage basis for the allocation of time to such work. One such organization permits its research men to put in 20 percent of their time on anything they like, and there is no restriction whatsoever on what they do with that time.

We have adopted no particular figure, but I guess it is running around 10 or 15 percent of our research effort.

—Thomas H. Vaughn

Engineering Research

With regard to academic research, our experience has definitely indicated that it can be carried on more economically in the long view by universities and research foundations. Academic research is the fountainhead of all future progress; but to carry on such research in an industrial corporation imposes too much of a strain on normal viewpoints and attitudes. After all, a corporation is run for the express purpose of turning out a product at a profit, and setting up an academic research group within corporate confines and then trying to wall it off from the motivating philosophy of the company is almost impossible. Too soon you will find your academic research group joyously—and profitably—engaged in engineering research or product development.

—James C. Zeder, Chrysler Corp.

At What Price?

Because the language of science is little known to the business man, and because the language of the business dollar is little known to the scientist, the top executive is, above all things, an ambassador and an interpreter be-

tween two worlds. Because the language of science and engineering is an obvious requirement, he is most apt to be deficient in the language of the dollar. He must know the sources and limitations of funds and the relative merits of the many demands for the corporation's money. Balance sheets and statements must be as familiar to him as critical tables. He must know something of markets and practical commercial economics generally. His job is one of the most important when the long-term success of the company is considered.

—Eric Walker,
Research & Development Board,
N. A. Shepherd,
American Cyanamid Co.

In some companies the idea prevails that a fixed percentage of each sales dollar should be set aside for research. At my company we are definitely opposed to any such rule. A good research program depends on an intelligent understanding of the job to be done, not on a knowledge of how much is available to be spent. When you have more money than projects, the research director has to look around for additional ways to spend it, and you have robbed him of the stimulation of having to compete with other divisions of the organization for his budget allocations. On the other hand, during periods of low sales volume, the fixed percentage system may result in drastic reductions in the research program at the very time when research should be expanding instead of contracting. It is far better for the corporation if the research department is required to sell the management on every dollar of its appropriation.

Engineering Liaison

Most productive results are obtained when the research department is integrated into the engineering organization instead of separated from it. There must be a balance, a harmony; one must not be tied to the other. Isolating a research facility from the rest of the corporation—either geographically or organizationally—has definite disadvantages. Research needs a reasonably close association with the rest of the engineering department in order to keep informed on the problems which exist and the directions which future research should take.

—James C. Zeder

Attitudes: Research Workers

Organized industrial research cannot achieve fullest success if the president and financial officer of the corporation, and for that matter, the

(Continued)



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The high-pressure dehydration unit here illustrated is a property of the United Gas Pipe Line Company at Carthage, Texas. It represents the most advanced design, construction, and operating technique; and the drying agent employed is FLORITE DESICCANT. The Stone & Webster Engineering Corporation, who designed and constructed the plant, are users of FLORITE in various types of equipment, large and small, for oil and gas companies and for other branches of industry.

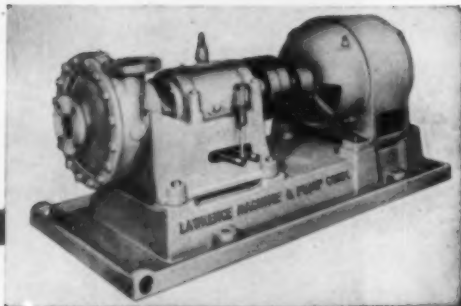
Natural gas, propane, butane, gasoline, air, nitrogen, carbon dioxide, refrigeration compounds, all are treated with superior drying efficiency by use of FLORITE. Selectively adsorbs 4 to 20% its weight of water—is regenerated by heating to 350°F. Write for literature, names of important users in your own field.

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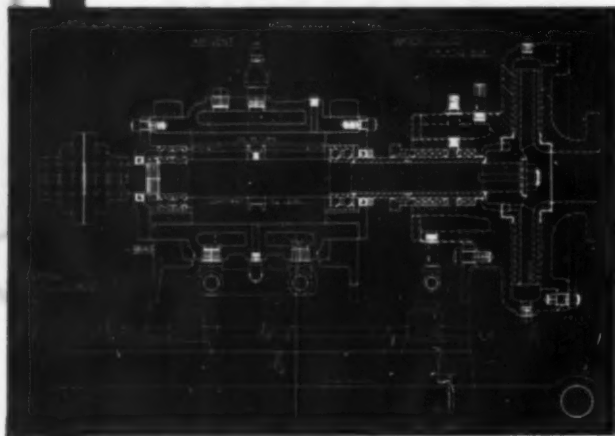


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QED, cont. . .

research administrator are the only ones whose decisions are governed by economic principles. While the research worker must be primarily a person of scientific integrity, he should possess also an awareness of economics as an attitude and a means to an end. Such a philosophy does not require an adding machine for every chemist and a cash register in the laboratory storeroom, but it does call for a wrecking crew for every ivory tower unless exceptional justification can be found for its existence.—Thomas H. Vaughn

Attitude: Research Heads

A research head has one of the most frustrating jobs in the world—selling new ideas to people who are operating successfully with old ideas—and he must not only have the courage of his convictions but also the salesmanship necessary to get them accepted by his management.

—James C. Zeder

ULTRASONICS

... Mix the Immiscible

Sound which the human ear cannot detect is being used for practical purposes by science and industry. These waves are of ultra high frequency and, therefore, beyond the range of human hearing. They are being used to mix liquids which ordinarily are not miscible, such as oil and water and mercury and water. The waves also are being used to test structural materials, such as concrete and steel, to determine whether they contain flaws.

The ultra high-frequency sound waves are produced by a generator developed by the Westinghouse Research Laboratories. One unit of the generator is a quartz crystal contained in a jar of liquids to be mixed. The device generates a high electrical voltage across the crystal. This causes the crystal to vibrate about 750,000 times per sec. and produce the ultrasonic energy that travels through the liquid, causing components to mix or emulsify, depending on the time of exposure. (See also p. 444.)

From Esso Oilways.

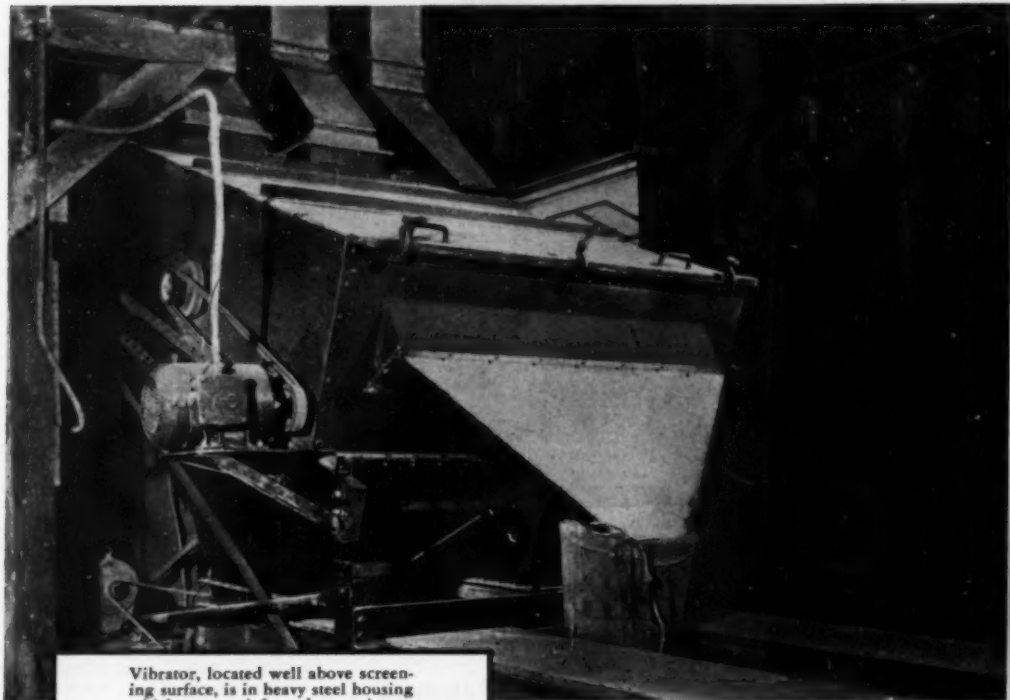
RAINMAKING

... New Evidence

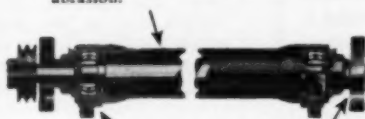
Experiments carried out at the U. S. Air Force Cambridge Research Labs. Have shown that "exposure to sunlight for at least 20 min. would probably have sufficient effect to decrease the ice-forming capacity of silver

(Continued)

How to get HIGH-CAPACITY, ACCURATE SIZING of fine, light materials



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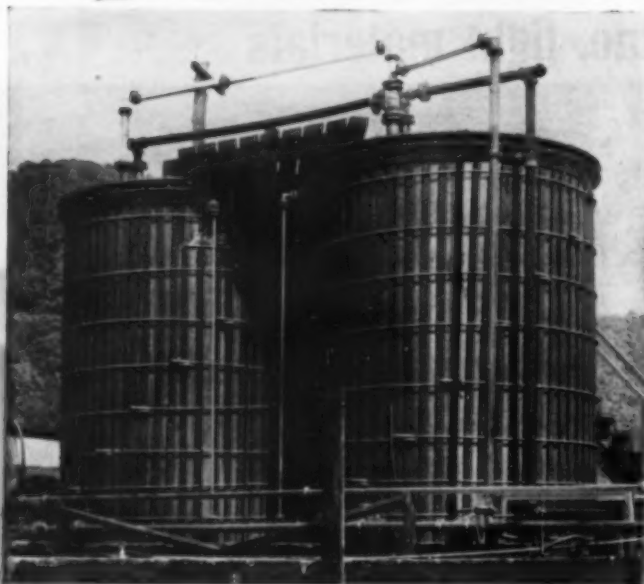
TODAY's processors demand higher output in less time. Yet sizing must be accurate. And that's exactly what you get with the Link-Belt "UP" Vibrating Screen. Its positive action and higher frequency vibration minimize blinding . . . even with the finest screen cloth. For full information, call your nearest Link-Belt office.

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Another advantage of Haveg equipment is the fact that alterations in design, as well as repairs made necessary through abuse, can be readily made on the job.

It will pay you to investigate all the advantages Haveg equipment offers you. Write today for bulletin.



QED, cont. . .

iodide released on a clear day. Furthermore, for longer exposures to sunlight the ice-forming capacity would eventually be completely destroyed assuming that no other modifications, physical or chemical, take place as the silver iodide nuclei are dispersed in the atmosphere."

Assumption is that particles of silver iodide, once they reach moisture-containing clouds, act as what the meteorologist calls a sublimation nucleus—the water vapor in the air forms around them as ice, without going through the liquid stage. Whether silver iodide or particles of matter naturally in the sky are used, the process is believed necessary to make rain.

Edward C. Y. Inn, of the Air Force laboratories, discovered that light changes the shape of silver iodide crystals. They were used, and presumed to be efficient, because they are shaped like ice crystals. If their shape is changed, they cannot form ice. The process of changing the shape by light is similar to the process of change taking place in a photographic film when light strikes it.

Mr. Inn using a light source in the laboratory on silver iodide nuclei in cloud chambers, discovered that they lost their power to make ice, and therefore rain, once they were changed in shape by the light.

Studies of the time it would take for silver iodide particles generated on the ground to reach a point where they can begin to operate as rain propagators have not been completed but it is known that the time is long.

Inn found that when silver iodide crystals which have been changed by light are taken out of the light, a curious "reversal" takes place. Some of the former ice-like crystals change back into unstable crystal-like formations. The question, he said, is whether this can take place in the atmosphere through some other physical or chemical modification.

From Science News Letter, June 2, 1951.

DESULPHURIZATION

... Low Boiling Fractions

E. F. Schwarzenbek
C. E. Slynstad & J. A. Knaus

Desulphurization of low-boiling distillates was accomplished by passing the oils over silica-alumina cracking catalysts with no extraneous hydrogen. Significant percentages of the sulphur containing compounds were converted principally to hydrogen sulphide with-

(Continued)

QED, cont. . .

out extensive conversion of the hydrocarbons to gas and coke. Effects of operating temperature, space velocity, feed-boiling range, catalyst type, and feed-sulphur type were investigated in a fluid catalyst pilot plant.

The desulphurization of virgin West Texas low-boiling distillates at 650 deg. F. resulted in the removal of 60-80 percent of the sulphur as hydrogen sulphide with the production of only 0.3-1.6 percent coke plus dry gas. The liquid recoveries, including produced butanes, were practically 100 percent.

The desulphurization of thermally cracked California distillates resulted in the removal of only 15-30 percent of the sulphur, and the production of coke plus dry gas was 1.8-2.6 percent. The liquid recoveries were about 98 percent.

E. F. Schwarzenbek, C. E. Slyngstad and J. A. Knaus, M. W. Kellogg Co., before the Third World Petroleum Congress, The Hague, The Netherlands, May 22-June 6, 1951.

EDUCATION

... Interesting Idea

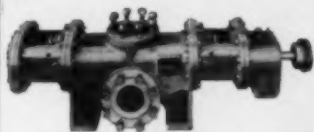
G. W. Govier

Education for the chemical engineering profession implies both professional preparation and general education. A sound chemical engineering curriculum should offer instruction in the basic sciences, general engineering, the engineering method applied to the chemical engineering field and in general subjects including English and the social sciences. While the importance of chemistry to the chemical engineer is not to be underrated its role is that of an important underlying science, not the focal point of curriculum.

The chemical engineer is characterized by his ability to apply not only the basic principles of physics, chemistry and mathematics but also his special tools; the material balance; the energy balance; the concept of equilibrium—both physical and chemical; the rate of reaction—chemical, thermal and diffusional and the economic balance.

The engineering educationalist is faced with a most difficult compromise; the ideal curriculum simply cannot be offered in the ideal time. Thus the problem is not what should be taught but how best may the available number of classroom hours be divided among the subject material which must be included. Each school—properly reflecting differences in personalities, facilities, and environment

(Continued)



• Pump shown: new External Gear & Bearing Bracket Type for non-lubricating fluids, semi-fluids. Capacities 1-700 gpm (discharge 1000 PSI for viscous liquids, 200 PSI for water).

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* Method

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Dry, free-flowing sand can be consolidated for excavation by auger or shovel with N Silicate of Soda. Reacted with sodium bicarbonate and injected as a single solution it acts as a temporary bond to hold loose-running sands when trenching, or to hold excavations until foundations are poured. The method saves time, labor and materials.

Send for File 48-2.

HARDER MAGNESIUM 2

A recently patented process covers a silicate coating to protect metallic magnesium against tarnish and increase resistance to abrasion. The metal is anodically electrolyzed in a solution of 24% alkaline borate, and 16% sodium metasilicate* with 0.1% phenol (to improve uniformity and density of coating).

Ask for File 31-3.

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QED, cont. . .

—arrives at a different solution to this problem of balancing courses and subjects.

Curriculum and course content is, however, but one side of the problem. The method of teaching is perhaps even more important. Again a compromise between too much and too little is necessary. Teaching at the university or professional school level should result in enough appropriate instruction to acquaint the student with the principles and enough practice or drill to give him facility in their use without stifling initiative and original thinking.

In its attempts to solve some of these problems the University of Alberta has developed a few ideas and methods which may be of interest elsewhere.

1. Required summer industrial experience.
2. Calculation laboratories.
3. Non-standardized experimental laboratory assignments.
4. Senior year project work and options.
5. Non-technical option in senior year.

G. W. Govier, University of Alberta, before the Chemical Institute of Canada, Winnipeg, June 18, 1951.

HYPERSORPTION PROCESS

... For Gas Fractionation

C. Berg

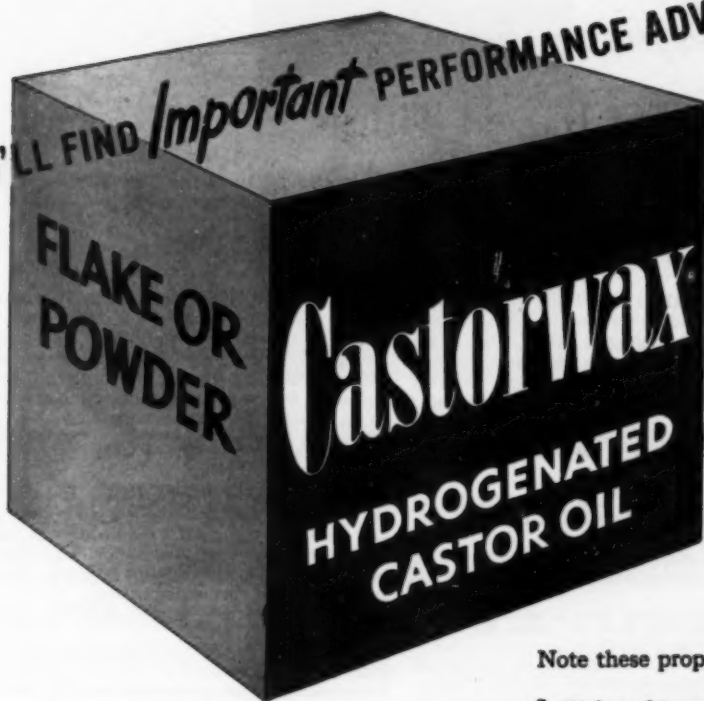
The hypersorption process is a new tool for the chemical and petroleum industry in the recovery and separation of extremely volatile and low-concentration gases. The process employs a moving bed of activated carbon to adsorb and fractionate the components of a gas stream. Success of the process was to a large extent a triumph in the development of techniques for processing the solids-gas contacting operation and the achievement of new and precise methods for control and instrumentation of solids flow.

The hypersorption process has now completed over four years of commercial operations. Units with capacities ranging up to 16,000,000 cu. ft. per day are in operation. As many as four well-fractionated products can be produced from a single hypersorption tower. Present installations treat gas streams derived in petroleum refining, chemical manufacture, and natural gas operation.

C. Berg, Union Oil Co., before the Third World Petroleum Congress, The Hague, The Netherlands, May 28-June 6, 1951.

—End

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flake Castorwax has proven very useful in hot melts, as a lubricant in drawing or rolling metals, in the manufacture of metallic soaps for greases, in paper coatings, etc.

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Note these properties:

- 1 High melting point, 85-87°C.
- 2 Excellent color, white in the solid form and straw-colored in the molten form.
- 3 Extreme insolubility, in that none of the common organic solvents will dissolve Castorwax.
- 4 High resistance to oils and greases.
- 5 Good hardness with fair gloss.

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A Roundup of Recent Titles

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WATER SUPPLY & TREATMENT. 13 pages on supply, 145 on treatment and 48 on methods of analysis. A small, concise, authoritative reference answering questions on water. An excellent companion for either Nordell (*Chem. Eng.*, May 1951, p. 291) or another association publication "Water Quality & Treatment" (*Chem. Eng.*, July 1951, p. 208).

Water Supply & Treatment. 7th edition. By C. P. Hoover. National Lime Association, Washington, D. C. 211 pages. \$1.37.

ADSORPTION. Includes new information reported in the literature since the 1945 edition. The book will continue to serve as a ready reference and its "deficiency in engineering aspects is offset by a thorough reporting of the technology of the large number of commercial adsorption processes."

Adsorption, 2nd edition. By C. L. Mantell. McGraw-Hill Book Co., New York. 634 pages. \$9.

URANIUM. First half of a comprehensive treatise on uranium chemistry. Covers: occurrence, extraction, physical & chemical properties of the metal. Preparation & properties of compounds with hydrogen, oxygen, nitrogen & halogens. Probably one of the most exhaustive critical surveys on any single element.

The Chemistry of Uranium. Part I. By J. J. Katz & E. Rabinowitch. McGraw-Hill Book Co., New York. 609 pages. \$7.25.

PEOPLE. American chemical industry's venerable historian has published his revised Who's Who. It's half again as large as its 14-year-old predecessor.

Chemical Who's Who, 3rd ed. Edited by William Haynes. Lewis Historical Publishing Co., New York. 395 pages.

FLUID AND PARTICLE MECHANICS. 15 chapters of latest developments in fluid mechanics based on a graduate course. A critical review of progress and applications in the chemical process industries. Some fundamental and theoretical background; emphasis is on industrial applications.

Fluid and Particle Mechanics. By C. E. Lapple, et al. University of Delaware, Newark, Del. 352 pages. \$6.

CHROMATOGRAPHY. A report of laboratory advances since the author's previous book (1938). Significance of this reporting of a mountain of work on chlorophyll, carotenoids, lipoids and the like: here is theoretical and experimental background on what will some day be a full-fledged unit operation.

Progress in Chromatography, 1938-1947. By I. Zechmeister. John Wiley & Sons, New York. 368 pages. \$8.

ORGANIC REACTIONS. Ten more chapters in the continuing, authoritative surveys of particular reactions: Stobbe condensation, synthesis of isoquinolines, Oppenauer oxidation, phosphonic & phosphinic acids, halogen-metal

interconversion, preparation of thiazoles, thiophenes & tetrahydrothiophenes, reductions with lithium aluminum hydride.

Organic Reactions. Vol. VI. Edited by Roger Adams. John Wiley & Sons, New York. 517 pages. \$8.

BEET SUGAR. Advertised as the first comprehensive book in English [on this subject] in 44 years. For three people: the farmer (beet culture, pest control, plant diseases, fertilizers); the plant worker (processing); the engineer (chemistry, chemical engineering, storage, packaging, wastes & byproducts, accounting). A reference manual on all phases of beet sugar manufacture.

Beet-Sugar Technology. Edited by R. A. McGinnis. Reinhold Publishing Corp., New York. 574 pages. \$19.

MECHANICAL ENGINEERING. You should know of the existence of this book even if you don't buy one. It will give quick answers in many fields: bearings, construction, compressors, conveying, illumination, lubrication, refrigeration, vibration problems, and other places where mechanical and chemical engineering overlap.

Mechanical Engineers' Handbook, 5th ed. By L. S. Marks. McGraw-Hill Book Co., New York. 2238 pages. \$15.

REPORTS. A textbook revised for general circulation. An excellent reference for both you and your company. Covers planning, collecting information, style, format, tables, illustrations, writing magazine articles, letter writing. Also: letter, short, formal and oral reports. Has many illustrative examples of "how to do it."

Report Preparation. By F. Kerekes & R. Winfrey. Iowa State College Press, Ames. 448 pages. \$6.90.

PAINT FILM DEFECTS. A British translation of a 14-year-old German book on cause & cure of paint film defects. Four sections: faults which develop (A) during storage, (B) during application, (C) after application, (D) in use. A book of considerable interest to makers and users of paints even though some of the data are obsolete and a few terms will be unfamiliar to American practice.

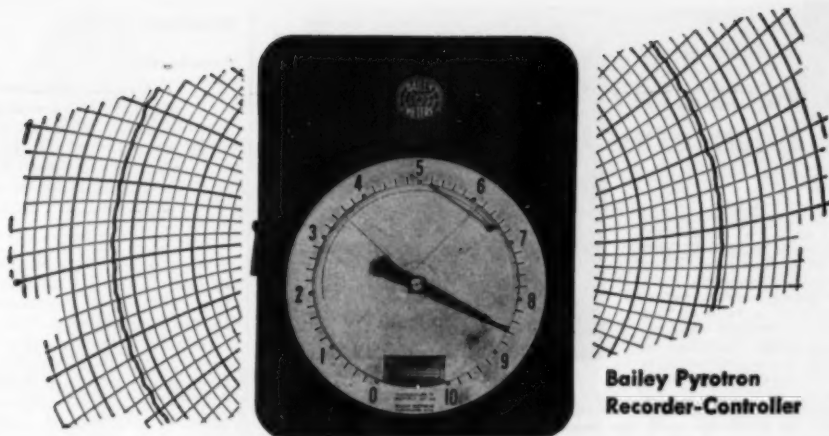
Paint Film Defects. By Manfred Hess. Reinhold Publishing Corp., New York. 344 pages. \$12.

RESEARCH. The first Columbia Conference on Industrial Research, held last year, emphasized the place of research in industry. This reprinting of the dozen papers presented allows you to attend this high-level meeting and get managerial views on exploratory & integrated research, economics & financing of research, cost analysis & project evaluation. Clinic discussions are included for you.

Costs, Budgeting & Economics of Industrial Research. Edited by D. B. Herts. Columbia University Press. New York. 261 pages. \$4.50.

FOOD ANALYSIS. Methods, coloring, preservatives, metals, poisoning. Milk & cream, oils & fats, sugars & carbohydrates, cereals & flour, jams, jellies & fruits, vegetables, spices, meats, vitamins, flavor, filth. Analytical methods to be applied for: standards, decomposition, quality control, control of processing & purchasing, toxicology.

The Chemical Analysis of Foods and Food Products, 2nd ed. Edited by M. B. Jacobs. D. Van Nostrand Co., New York. 902 pages. \$9.



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Looking for Better Temperature Instruments? ... Then check these features of Pyrotron Electronic Resistance Thermometers ...

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Bailey Pyrotron Resistance Elements are made of highest purity platinum—the material used by the National Bureau of Standards in establishing basic standards for temperatures from -190°C to $+660^{\circ}\text{C}$.

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Pyrotron Controllers may operate: on-off electrical systems by either electronic relays or electric contacts, modulated electronic systems, or air-operated systems. Two temperatures may be recorded on the same chart and controlled by a single instrument.

FACTS PUT INTO USABLE FORM

Bailey Pyrotrons may be arranged to put temperature facts into convenient usable forms. If two or more temperatures are related, they may be recorded as continuous records on the same chart for easy comparison. The average of several temperatures or the difference between two temperatures may be recorded as a single continuous record which may be

retransmitted to a distant point or used to actuate a control system.

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Bailey Pyrotrons do not require careful leveling or protection against vibration. Three ordinary copper wires are all that is needed to connect each temperature sensitive element with the recorder. Power may be taken from any 115 volt 60 cycle circuit.

MINIMUM MAINTENANCE

The absence of galvanometers, batteries and standardizing equipment, together with the use of interchangeable unit assemblies, reduces Pyrotron maintenance to the vanishing point.

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A separate motor drive for each temperature furnishes abundant power to operate a recording pen, a controller and an alarm switch.

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P-21

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BOOKSHELF, cont. . .

Standards

FACHNORMENAUSSCHUSS FÜR CHEMISCHE LABORATORIUMSGERÄTE. Prepared under the direction of H. H. Franck, Normenausschuss Laboratoriumsgeräte, Ulmenstrasse 10, Frankfurt a.M., Germany.

Reviewed by J. C. Lawrence

A set of standards has been issued by the German Standards Association (Deutsche Normenausschuss). It was prepared by the Deutsche Gesellschaft für chemisches Apparatewesen (DECHEMA). They cover standard definitions (2 sheets); standard flow sheets and symbols (1); alternative construction methods (1); standard methods of corrosion testing (8); standard lead coating thickness (1); standard dimensions for acidproof stoneware (32); standard dimensions for flanged connections and fittings—cast iron and semi-steel (6); standards for cast iron and steel tank supports (4); standard dimensions for sight glass disks (1); standard filter press plate dimensions (1).

The dates of issue run from 1929 to 1945, with most from the middle 1930's to 1942. By and large these seem to be rather elementary. Most of the "equipment" standards relate to chemical stoneware which is pretty well standardized by the manufacturers in this country.

While not likely to be useful to the chemical industry in the United States, they would be found interesting to those concerned with standardization in these several fields.

A Look at Research

PROCEEDINGS OF THE FOURTH ANNUAL CONFERENCE ON THE ADMINISTRATION OF RESEARCH. University of Michigan Press, Ann Arbor. 91 pages. \$3.

In 1947 the first conference on the administration of research was held at the Pennsylvania State College School of Engineering. It was begun by men who had suddenly been placed at the head of large research laboratories established during World War II. New to a great responsibility, some of these men thought that an exchange of information regarding their own procedures and practices might be of benefit to others.

The first conference was successful enough to warrant a second and the second, in turn, led to the idea of an annual conference. This year's conference will be held at the University of Michigan, September 24-26.

The proceedings of the fourth conference (Continued)



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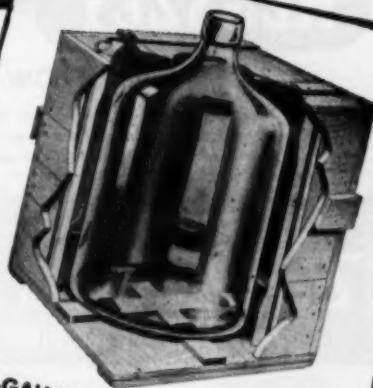
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3. Eliminates foreign filler materials from container.
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The graduations on the dial are uniformly spaced from one end to another and read direct—without constants. The meter is installed right in the pipe line.

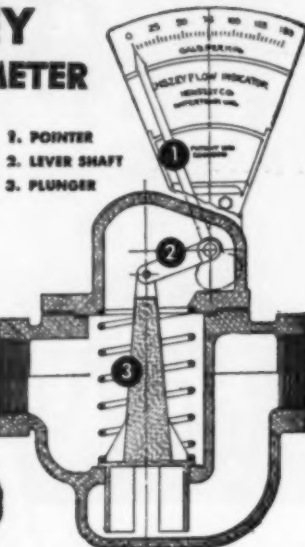
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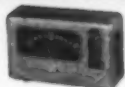


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The foremost relative humidity recorder for laboratory, factory, and office use. Scientifically designed for accuracy and dependability.



Model 573
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Designed to determine wet and dry bulb temperature with laboratory accuracy—Motors supplied for use on 115 V., 50 cycles or 60 cycles.



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A small, low cost instrument. Thermometers graduated in 1° increments from +35° F to +110° F. Furnished complete with case and psychrometric slide rule.



Model 550
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BOOKSHELF, cont. . .

ference cover the subjects "Calculated Risk"; "Measuring the Return from Research"; "What Is Needed in a Research Executive"; "Overhead"; and "New Government Services to Research." The subject matter of the papers is excellent, the presentations good, the discussions stimulating. —RVR

Plating

ELECTROPLATING FOR THE METALLURGIST, ENGINEER & CHEMIST. By J. B. Mohler and H. J. Sedusky. Chemical Publishing Co., New York. 257 pages. \$5.

Reviewed by A. H. Pope

The book discusses the important aspects of electroplating without going into details on operation practices and electrochemical theory. The necessary fundamentals such as bath voltage polarization and current distribution are discussed in simple, nontechnical language. The characteristics of plating bath, the nature of the deposit, composition of common plating baths, control methods, and analytical procedures are covered.

Specific chapters are devoted to various special applications. The most frequently encountered plating troubles, their causes and corrections, are treated in a separate chapter.

This text should prove very satisfactory to the group for whom it was written; the practical plater might have difficulty finding sufficient information to enable him to set up a complete cycle for plating a given product.

Cook-Zook Book Looks Good

ORGANIC CHEMISTRY. Second edition. By Frank C. Whitmore. D. Van Nostrand Co., New York. 1,005 pages. \$12.

The committee of colleagues of the late "Rocky" Whitmore, listed alphabetically from Cook to Zook, has done a fine job in bringing this standard reference work up-to-date. It is still designed as a one-volume reference text for those who have had at least one year of organic chemistry.

Some rearrangement of sections in the book have been thought helpful. The abbreviated references used in the first edition have been replaced with complete references. The index has been changed to a style similar to the style of *Chemical Abstracts*, and its completeness can be estimated from the fact that it occupies nearly 15 percent of the book. Major changes

and additions have been made in the material in the aliphatic and heterocyclic sections to keep pace with the rapid advances in these fields.

A preface by Mrs. Frank C. Whitmore adds a brief personal touch to the volume which "Rocky's" many friends will surely appreciate.—GWM

Properly Introduced

CHEMISTRY OF ORGANIC COMPOUNDS. By C. R. Noller. W. B. Saunders Co., Philadelphia. 885 pages. \$7.

Monofunctional aliphatics occupy the first section of this introductory text. The need for considering the effect of the rest of the molecule on the functional group under discussion is thus eliminated. Monofunctional and polyfunctional aromatics and finally polyfunctional compounds follow in that order. The author's aim: one topic flows naturally from the one before it—confusing complications are avoided until the ground has been well prepared for them. Emphasis is on forces which determine the chemical and physical properties of organic compounds and the mechanics of reactions. The author's idea in this case: theories which correlate facts aid memory.

By using two type sizes the book fills the needs of the average beginner as well as his more precocious brother. In standard type are printed methods of preparation, nomenclature, chemical reactions, uses of organic compounds—the clean outlines of the organic field. The novice can get his bearings before he has to pigeonhole a mass of details. But the details (portions dealing with mechanism, anything of a supplementary nature) are also there, in small type, for anyone who can assimilate them.—FA

Review

CHEMICAL KINETICS. By Keith J. Laidler. McGraw-Hill Book Co., New York. 408 pages. \$5.50.

Reviewed by G. F. Kinney

A concise treatise on the important topic of chemical kinetics is to be welcomed by workers in many fields, including those of the chemical engineer and of the physical, organic, and bio-chemists. This new addition to the International Chemical Series is both comprehensive and concise, and fills a long felt want.

The text begins with a brief discussion of kinetic problems, followed by a description of experimental methods which have been used in kinetic studies. This is followed by a treat-

(Continued)

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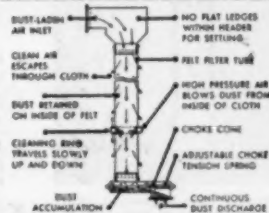
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Write-to-DAY for Bulletin 491



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ment of the kinetics of simpler reactions in the gas phase, in solution, on surfaces, and in the solid state. Complex reactions are considered from the standpoint of the individual stages involved, and typical complex inorganic and organic reactions are discussed. Concluding chapters consider catalysis, oxidation, polymerization, and the potential-energy surface.

The treatment is both fundamental and theoretical, and on the whole is largely non-mathematical, requiring but little specialized mathematical knowledge. It is remarkably well organized and presented. For example, reaction order with respect to concentration is clearly distinguished from reaction order with respect to time. The author also points out that chemical affinity is not related to the speed of chemical change, and that chemical equilibrium and chemical kinetics are best kept separate.

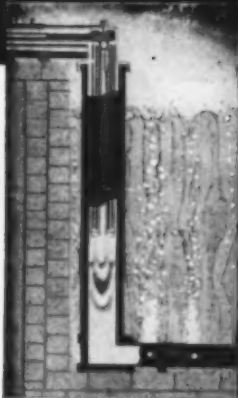
Considered as a text, the material provides an adequate background for reading the current literature, and also includes numerical problems that illustrate the principles. As a reference, it provides the practicing chemical engineer or chemist a comprehensive, unified review of this important field.

Recent Books & Pamphlets

Subject	Summary	How to Order
Motors	Over-all, up-to-date picture of the field and its impact on the chemical processing industries. Sections on: selection; relative cost; motors for constant speed drives and for variable speed drives; control equipment; mechanical features. Numerous diagrammatic illustrations. 14 pages.	Reprint No. 179, Editorial Dept., Chemical Engineering, 330 West 42nd St., New York 18, N. Y. 50 cents.
Boiler Water	Water treatment, methods of operation, methods of cleaning and maintenance. Designed for operators of Federal boiler plants.	"Boiler-Water-Treatment Manual for Federal-Plant Operators." By Louis Goldman. Bureau of Mines Handbook 5. Superintendent of Documents, Washington 25, D. C.
Defense Loans	Summarizes hearings held during March and April at which Defense and industry officials described the basis for granting rapid amortization of new capital required for the defense program.	"Certificates of Necessity and Government Plant Expansion Loans." House Report 504. Committee on Expenditures in the Executive Departments, House of Representatives, Washington, D. C.
Minerals	Latest complete report on the quantity and value of minerals produced in California. County-by-county breakdown of information. Locations of the producing operations; names and addresses of operators. Includes a directory of mineral dealers and commercial laboratories. 116 pages.	"Annual Directory of Minerals, Production and Producers." California Division of Mines, Ferry Bldg., San Francisco Calif. \$1.

(Continued)

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RECENT BOOKS & PAMPHLETS, cont. . .

Subject	Summary	How to Order
Dehydration	Effectiveness for truck-drying vegetables of: counterflow tunnel; parallel-flow (countercurrent) tunnels; two-stage tunnels; combination compartment and tunnel; other tunnel arrangements. Phantom drawings show operation and construction of equipment. 30 pages.	"Tunnel-and-Truck Dehydrators, As Used for Dehydrating Vegetables." By W. B. Van Arsdal. Western Regional Research Laboratory, 800 Buchanan St., Albany 6, Calif.
Drives	Proper sheaves and V-belts to be used for optimum efficiency and economy of the complete drive in relation to the particular duty required. Most of the data is in table form. 16 pages.	"Engineering Standards for Multiple V-Belt Drives." Rubber Manufacturers Assn., 444 Madison Ave., New York 22, N. Y. \$1 for two copies.
Spectroscopy	Development and use of spectroscopic methods in analytical control. Applications and limitations of both emission spectra and absorption spectra procedures. Liberally illustrated. Aimed at the non-specialist. 52 pages.	"Chemical Spectroscopy." By Wallace R. Brode. American Society for Testing Materials, 1916 Race St., Philadelphia. \$1.35.
Control Valves	Standards for flanged valves which are in the category of diaphragm actuated control valves of the plug type. Sizes included are 1/4 through 8 in. 4 pages.	"Uniform Face to Face Dimensions for Flanged Control Valve Bodies." Instrument Society of America, 921 Ridge Ave., Pittsburgh 12, Pa. 25 cents.
CMP	To help companies which will operate under the CMP in setting up the records they will have to maintain in preparing the necessary forms. 24 pages.	"Allotment Accounting for Consumers under CMP." Department of Commerce, National Production Authority, Washington 25, D. C.
Applied Chemistry	Symposium containing five papers. One by Merrell R. Fenske covers "Physical Separational Processes."	"Twenty-Fifth Annual Priestley Lectures." Phi Lambda Upsilon, Department of Chemistry, Pennsylvania State College, State College, Pa. \$2.
Manpower	New monthly published by the Department of Labor compiling statistics and labor and employment projects useful for management and operating executives dealing with these problems.	"Labor Market and Employment Security." Superintendent of Documents, Washington 25, D. C. \$3.50 a year.
Pigments	How to get the highest uniformity of dispersion. Consideration of vehicle types in terms of their viscosity, structure and tack. Titanium has been used as a subject for showing examples of poor and excellent procedures. 20 pages.	"Practical Aspects of Pigment Dispersion." By W. H. Hoback. Technical Bulletin 903. American Cyanamid Co., Calco Chemical Division, Bound Brook, N. J.

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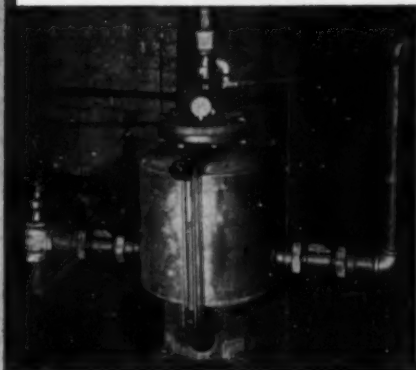
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How Plastics Are Growing to Meet War Needs

All branches of the synthetic resin industry have been feeling the impact of the mobilization effort. Here is the way they have met increased demand in various markets.

Large-scale shifts in many process industries have occurred in the present mobilization program. More are coming. Most of the shifts have been forced on the nation by shortages of primary raw materials and rising prices. Some have resulted in a better product for a given job as chemical engineers strive to increase the supply of scarce raw materials. Other shortages have concentrated attention on the wasteful methods employed in processing products with once plentiful products like sulphuric acid. Here the shortage will ultimately result in more efficient operations as a considerable part of the total, now wasted, is recovered.

In addition to the current wartime pressures on supply, there is the steady long-term growth of the chemical process industries. While the trend varies in each part of the CPI, in the plastics industry it is definite.

Back in 1948, an all-time record production of 1,486 million pounds was turned out. In the readjustment year of 1949, the other industries generally dropped below the 1948 output marks. However, the plastics and synthetic resin industry just topped the old record as it produced 1,491 million pounds. Then in 1950 output jumped up to the 2,151 million pound mark. To see how this jump occurred it is necessary to take a closer look at the statistics that make up this total.

Molding materials—These vital products are rolling along at a steady pace. In 1949, use of phenolics in this part of the industry reached 130 million pounds. In the same year, styrene molding compounds had climbed to 185 million pounds. Vinyl resins going into this market had reached 82 million pounds. Other resins contributed about 60-70 million pounds in the same year.

This market grew considerably in 1950. Phenolics jumped up to 222 million pounds, styrene soared to 260 million pounds, vinyls rose to 112 million pounds while another 100 million pounds were supplied by other resins.

This year phenolic molding compounds are being produced at the 1950 rate. In spite of the synthetic rubber needs, styrene molding compounds are still being made at the rate of 244 million pounds per year according to the latest data published by the Tariff Commission. This is slightly below last year's rate. Vinyl molding compound firms are also running slightly ahead of last year's rate.

Protective coatings—In 1950 phenolic resin units supplied 46 million pounds for protective coatings. This was 6 million pounds ahead of the 1949 rate and this year's rate is pushing toward the 60 million pound mark. Both modified and unmodified resins are used here. Urea and melamine resin makers are currently pushing about 26 million pounds into this market. Last year this section of the resin industry took about 30 million pounds of urea and melamine resins.

Styrene resin firms supplied 17 million pounds here in 1949. They raised this to 26 million pounds in 1950.

Biggest source of protective coating resins are the alkyd resin manufacturers. Alkyd resins used in protective coatings totaled 401 million pounds in 1950—about 137 million pounds above the 1949 rate. Current output for this market is below 1950 rate and above the 1949 level. However, it should pick up later in the year.

Laminating resins—This end-use for synthetic resins has become important enough in recent years to have the Tariff Commission list it as a separate classification along with molding, adhesives, protective coatings and textile and paper treating resins. In 1949, about 39 million pounds of phenolics were used here. In 1950 this figure had soared to 75 million pounds. Current operations match 1950.

The amount of the other resins used in the laminating industry is concealed in the official figures, but some idea of the amount of urea and melamine resins can be found in the total output for both molded and lamin-

ating amino resins. This year the combined figure has reached an annual rate of 100 million pounds.

Textile and Paper Treating—Urea and melamine resins supply about 35 million pounds a year to textile and paper firms, for use in treating these products. Vinyls supply another 46 million pounds per year to these industries. This is almost double the amount supplied by vinyl resin producers in 1949. Vinyl use is still growing with the demand for the end products. Use of other resins in this market is also on the upgrade.

Adhesives—Here is another growing market for the synthetic resin producers. In 1949 about 29 million pounds of phenolic resins were consumed as adhesives. Last year about 32 million pounds went into this market. An equal amount will be used in 1951, according to preliminary statistics.

Urea and melamine resin manufacturers are producing approximately 109 million pounds a year for adhesives. In 1949 they produced only 41 million pounds for this industry.

Vinyl resins are also used in the production of adhesives. In 1949 almost 12 million pounds were used in making adhesives. Then the use jumped to 15 million pounds last year. Adhesives are currently consuming vinyls at the rate of 12 million pounds per year.

Outlook—In the newer, fast growing markets plastics and synthetic resins are finding a big market. Of course the basic markets that have stood the test of time are also contributing to the long term growth of the synthetic resin industry. Large scale military uses for synthetic resins will be making their impact felt on the industrial scene this year.

The coming huge benzene increase from petroleum sources (see page 279) will solve the major raw material bottleneck now facing most resin producers. As the metal shortage becomes more acute, the addition of this benzene capacity will allow resin manufacturers to step up production of phenolics, polystyrene, and other resins which utilize it as a raw material.

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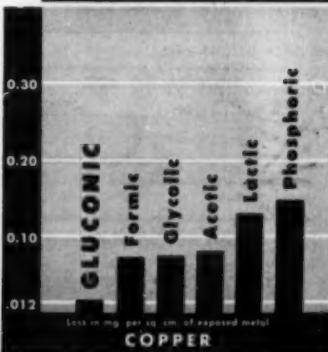
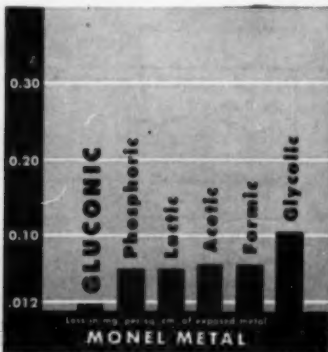
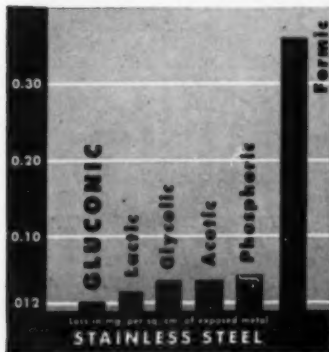
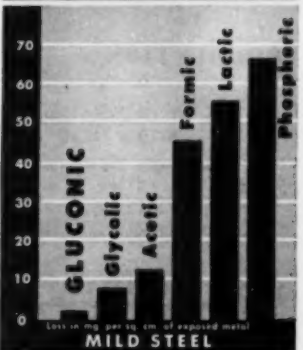
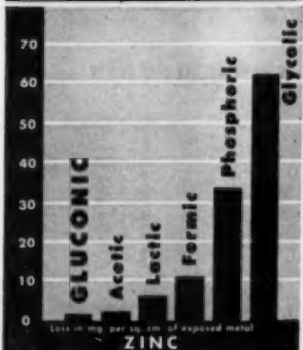
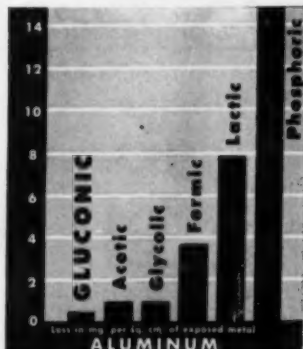


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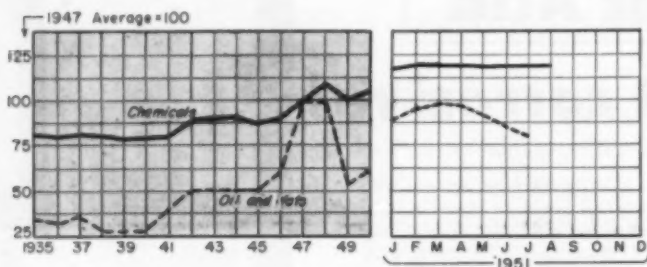
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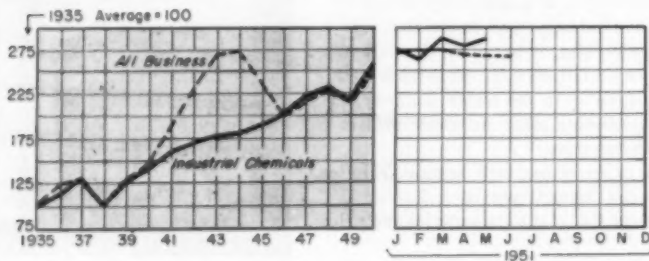
PRICES



Chemical Engineering's Price Indexes

	Chemicals - Up	8.37	
	Fats & Oils - Down	4.26	
	Chemicals		Oils & Fats
As of August 1	110.35		76.69
Last month	118.90		80.95
August 1950	103.27		62.33
August 1949	100.54		52.25

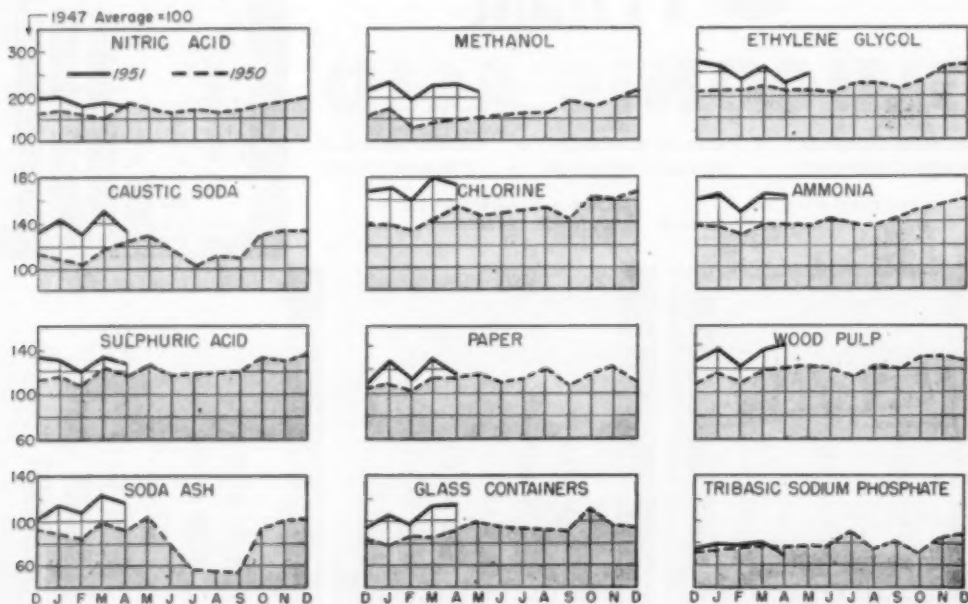
CONSUMPTION



Industrial Chemicals Index

	April (Revised)	May
Fertilizers	62.80	61.65
Pulp and paper	29.60	33.95
Petroleum refining	24.10	25.99
Iron and steel	16.25	16.68
Rayon	31.15	31.95
Glass	25.15	24.65
Paint and varnish	28.25	30.65
Textiles	13.20	11.85
Coal products	11.63	11.57
Leather	4.20	4.01
Explosives	8.53	9.12
Rubber	6.21	6.83
Plastics	19.30	19.08
INDEX	279.87	286.10

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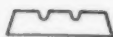
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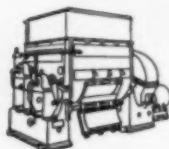
AIRPLANES NEED ALUMINUM



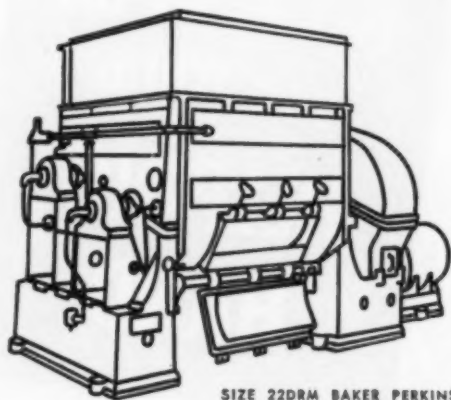
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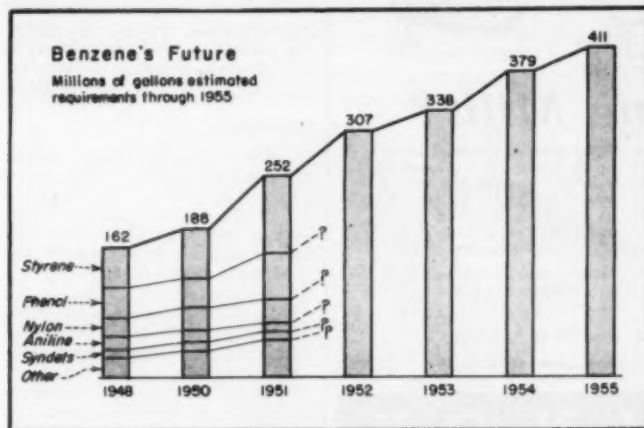
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Benzene Shortage

Is petroleum the answer? Catalytic reforming looks like the best long-range solution. Here are the facts of present and future supply and demand coupled with an analysis of the Platforming process.

If mobilization continues, as it most certainly will, 411 million gallons of benzene will be needed by 1955. The big users of benzene are expanding facilities as fast as—and in some cases faster than—Certificates of Necessity can be granted. Styrene capacity is going up about 200 million pounds a year. Those 200 million pounds will mean about 30 percent more benzene than is now used for that purpose. Phenol, the second largest consumer of benzene, has a present capacity of 350 million pounds per year, is being expanded by about 43 percent or 150 million pounds. Aniline, now in short supply because of increased requirements for processing synthetic rubber, will be increased at least 20 percent in the immediate future. Although detergent capacity in 1951 will be about 1.2 billion pounds, some people think that it would be increased to 2 billion if enough benzene were available. Even with lesser mobilization demands, consumption of benzene will probably go up.

Where Is It Coming From?

With present capacity stretched to its limits, every potential source is be-

ing studied: coke-oven operation, imports, coal hydrogenation and petroleum. Present indications are that almost all of the increases will necessarily come from petroleum.

Coke Ovens

Formerly, the entire benzene output came from coke-oven operation. However, steel men were mostly indifferent to light oil recovery, at least until benzene began selling at volatile prices. Right now studies are being made to increase light oil recovery in existing plants so that 10 million additional gallons of benzene will be made available annually. In addition, another 10 million gallons can be made by expanding coking capacity as now planned. These increases would raise coke-oven benzene production from the present rate of 170 million gallons to 190 million per year. This figure, however, is the maximum expected from the steel industry.

Imports

Imports have been increased and are expected to reach 40 to 50 million gallons in 1951. The shortage of benzene, however, is world-wide and it is doubtful that imports can be main-

tained at this level. In fact, they may be cut off entirely.

Coal Hydrogenation

It has been estimated that two plants for the production of synthetic fuels would produce as one of the products over 30 million gallons of benzene yearly. But initial cost of the two plants is reported to be about \$325 million, construction would take from two to three years.

Petroleum

Assuming maximum production from other sources, about 70 million gallons of petroleum-derived benzene will be needed in 1952 to satisfy total demands of 307 million gallons. Although present production by the petroleum industry is at the rate of only 12 million gallons per year, a number of new plants are either in the design or construction stage. Certificates of Necessity granted and applied for, indicate that the oil industry will increase benzene production by at least 60 million gallons a year if construction is allowed to proceed. This additional capacity will raise petroleum's contribution to over 72 million gallons a year. If predicted amounts are available from other sources, production should reach a rate of 312 million gallons in 1952.

And Petroleum Facts

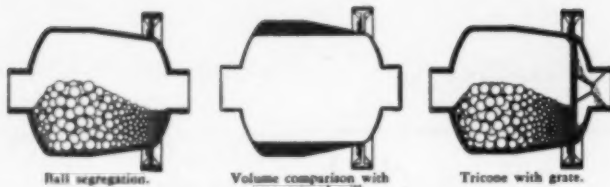
Seventy-two million gallons is a large quantity of benzene but petroleum people aren't impressed with that figure. They speak, theoretically, of over-all yields as high as 800 million gallons per year; prophetically, of 200 million gallons per year within the close future.

Are these figures justified? Let's look at the facts.

The 140-185 deg. F. fractions of straight-run gasolines will include from 20 to 55 percent of methyl cyclopentane and cyclohexane, percentages varying with the oil field. Combining this fact with an estimated 24 billion barrels (42 gal. per bbl.) of crude oil to be produced in the U. S. in 1951, and making the necessary adjustments for yield, oil men have come up with the 800 million figure.

Methyl cyclopentane and cyclohexane are readily converted to benzene by several processes of catalytic reforming. Among the newest and most promising of these are the Platforming process of the Universal Oil Prod-

(Continued)



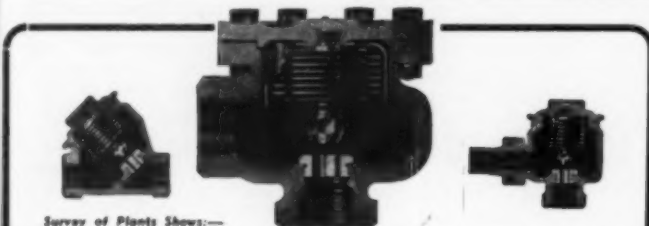
WHY Tricone Mills?

1. The tapered barrel causes correct ball alignment. Grinding energy is conserved thereby. Ball consumption is reduced, the big fellows are kept away from the little ones.
2. The Tricone Mill occupies less floor space for a given grinding volume than any other type of mill ever built.
3. New design bearings reduce friction and cut overall power consumption about 5%.
4. When crowded for more capacity, a grate is added, at a proportionate increase in power, but with this type of grate mill, the large balls are kept at the feed end, and only smaller balls are in contact with the grate, which minimizes wear.
5. Tapered ends reduce end friction, as is evidenced by lower liner consumption and power.
6. Ideal for large tonnages.

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15 of 20 Engineers Prefer Nicholson Traps

To determine the best steam trap on which to standardize, a large processing firm recently asked their plant engineers for their preference. In 15 out of 20 plants the choice was Nicholson.

The repeated adoption of Nicholson steam traps in plants currently in big "cost-reduction-through-modernization" programs is another indication of their advanced features. To learn why an increasing number of leading plants are standardizing on Nicholson thermostatic steam traps send for our catalog. 5 types for every power, heat, process use; size 1/4" to 2"; press. to 225 lbs.

Catalog 751 or see Sweet's

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WILKES-BARRE, PA.



COMMODITY SURVEY, cont. . .

ucts Co. and a similar process of the Atlantic Refining Co. UOP has four plants in operation, 14 under construction to date.

The Platforming process is already in commercial operation for upgrading gasolines while other units are in the planning, design or construction stage for the production of benzene.

Technology

Methyl cyclopentane and cyclohexane are converted to benzene in one stage. Yields are as high as 80 percent and may be increased by recycling. Moreover, the yield of benzene is increased by the fact that the feed stocks already contain from 1 to 9 percent of natural benzene.

The Platforming process uses a platinum catalyst. It is a continuous process in that periodic regeneration of the catalyst is not necessary.

Principal reactions are dehydrogenation, hydrocracking, isomerization, desulfurization. The 1 to 9 percent of benzene already present in charging stocks goes through the process without change.

Important to the economics of aromatic production is the fact that gasolines of improved octane number are produced under the conditions used for aromatics production.

Another fact important to the economic picture is the simultaneous production of toluene, the xylenes and ethyl benzene.

Toluene is the basic material for TNT and aviation gasoline; the xylenes are important chemical intermediates in the production of phthalic anhydride and for the newer synthetic fibers. Although separation of the isomers is difficult and costly (the boiling point of the ortho xylene differs from the others by only 5 deg. C.), the value of the individual isomers makes that separation well worth while. Ethyl benzene is the basic material for styrene which is the largest consumer of benzene.

Over 1,600 million gallons of toluene can be theoretically derived from the 1951 production of crude oil. For the xylene and ethyl benzene the figures are 2,100 and 375 million gallons respectively.

With all of these factors in mind, the over-all benzene-from-petroleum picture appears to be sound, well-balanced and economically promising.

The foregoing material is based on papers prepared by Gustav Erlhoff and Vladimir Haensel, Universal Oil Products Co., and delivered before the American Institute of Chemists and the American Institute of Chemical Engineers respectively. Estimates of benzene requirements were prepared by L. A. Schlueter of the National Production Authority. *—End

BACK IN THE 1880'S

WHEN THE FIRST DESK TELEPHONE WAS USED



Koven

**WAS MAKING INDIVIDUALIZED
CHEMICAL EQUIPMENT**



One of several A. S. M. E. welded chemical fractionating towers, each 105 feet long.



Just as the greater convenience of the first desk telephone encouraged heavier business transactions, so the efficiency of the KOVEN individualized equipment that was replacing outmoded contrivances of the day helped chemical manufacturers increase the production capacity of their plants. And like telephone designers, KOVEN engineers kept pace with the changing needs of the chemical industry and today are designing and building special equipment that meets the individual needs of modern chemical manufacturers, enabling them to realize greater profits through faster, more efficient and economical operation. The resources of our skilled engineers and two huge plants are ready to help you operate more profitably. Write or call today for a consultation—no obligation. Our complete modern facilities include: machine, welding, painting and galvanizing shops, X-ray inspection insures quality control. KOVEN equipment in all commercial metals and alloys includes: pressure vessels, extractors, heaters, stills, condensers, boilers, tanks, chutes, containers, stacks, coils. Fabrication to A.S.M.E. Code par. U-68 and U-69 a specialty.

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KOVEN FOR INDIVIDUALIZED CHEMICAL EQUIPMENT SINCE 1881

HANDLING LIQUID CAUSTIC

(Continued from page 113)

with dilution water at various temperatures. The final volume of the diluted solution can be found in column 3. This has been calculated on the basis of the average maximum dilution temperature.

73 PERCENT CAUSTIC

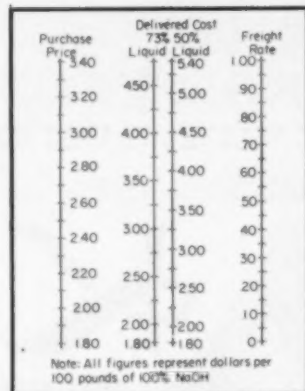
The second commercial form of liquid caustic soda is the 73 percent liquor. Normally, this contains 71 to 73 percent sodium hydroxide. At ordinary atmospheric temperatures it is a solid, for upon cooling, crystallization begins at about 45 deg. F. Tank cars for 73 percent liquid caustic soda are always fully insulated. It is the usual practice for producers to load at elevated temperatures so that the caustic will be received at a temperature above 200 deg. F.

In addition to the high temperatures required to keep 73 percent caustic liquor in the liquid state, a considerable quantity of heat is evolved as dilution is effected. Dissipation of heat becomes one of the most important problems in the handling of this material. Table II shows heat characteristics of 73 percent liquor dilutions.

The maximum temperatures are very much higher than those experienced in the dilution of 50 percent liquid caustic soda. A few are near or even above the boiling point. At the higher temperatures and concentrations, the solutions are very corrosive to steel equipment and are extremely difficult to handle from the standpoint of safety. It is general practice to cool the diluted solutions below 150 deg. F. Total volumes of various diluted solutions have been calculated on a 140 deg. F. basis which is a good average condition. The quantity of heat that must be removed per ton gross weight of 73 percent caustic soda to reach 140 deg. F. from the maximum dilution temperature is listed.

The 73 percent liquid caustic soda is seldom placed in storage at full strength by the consuming industries. It is accepted practice to dilute the 73 percent liquor as it is pumped from the tank car. The concentration for storage varies according to what may be desirable, however, this is very frequently established as 50 percent. The caustic system is, then, treated as a 50 percent system from this point.

The additional equipment that is needed for a 73 percent caustic soda



Use this to figure your NaOH cost.

system is (1) a mixing arrangement, and (2) a means of dissipating the heat of dilution. Dilution water is metered into a mixing tee where it is combined with a definite flow of the 73 percent caustic soda. The solution that is formed passes through a water-cooled heat exchanger to remove the heat of dilution and thence to storage.

The pipeline from the tank car to the pump should be no less than 2 in. dia. and preferably 3 in. dia. All 73 percent caustic soda lines should be well insulated and for added convenience steam traced. The viscosity at 210 deg. F. is not high but cooling of the liquor near the pipe surface will appreciably increase resistance to flow. A length of more than 50 ft. for the pump suction line is undesirable. The discharge line from the pump may be 2 in. dia. A properly designed dilution system will have a minimum piping distance between the pump and the heat exchanger.

Centrifugal pumps are used on occasion, however, a rotary, positive displacement type pump is advantageous for the dilution phase of the unloading-dilution operation. A capacity of 30 to 50 gpm. will permit the tank car unloading and dilution operation to be accomplished during one 8-hr. shift. At this rate a standard design heat exchanger can be used. The most simple dilution water feed arrangement has been shown. Proportioning and metering pumps for both the dilution water and the caustic soda have been used successfully but such apparatus increases the original capital investment.

In order to determine the size unit required, certain factors such as caustic pump delivery rate, cooling water

temperature, and dilution concentration must first be established. For diluting 73 percent liquid caustic soda to approximately 50 percent at a rate of 40 to 50 gpm. and with a maximum cooling water temperature of 70 deg. F., an exchanger of 600 to 800 sq. ft. of cooling surface will serve the needs of most mills. Cooling water requirements will not exceed 200 gpm. If the cooling water is 60 deg. F., the volume may be reduced to under 150 gpm. or an exchanger of smaller dimensions may be used. Water at 80 deg. F. would require as much as 500 gpm., or if preferable a unit with a larger cooling area can be substituted.

The materials of construction for both the 73 percent and mixing sections of the system may be black iron, steel, or cast iron. Heavy-duty piping is essential. Certain alloys and nickel will give a much longer service than iron and steel. Unless a small amount of iron contamination is undesirable the extra expense encountered for the more resistant metals is questionable. The unloading of a 73 percent tank car, because of the dilution that is necessary, has to be properly controlled and requires the attention of an operator. The 50 percent form is different in this respect for this involves only the unloading of a liquid raw material.

In using liquid caustic soda, it is the problem of each user to decide which form is the more economical. The advantages of the 50 percent form are: (1) a less hazardous material to handle, (2) few heat problems, (3) less capital investment, and (4) lower operating costs. The 73 percent liquid caustic soda has one important advantage that can easily dictate the use of this form and that is delivered cost per unit of anhydrous caustic soda.

The freight charge is based on the total weight of tank car contents, caustic plus water. The accompanying nomograph compares the delivered cost of the two liquid forms of caustic soda.

Assume that a freight rate of \$0.35 per 100 lb. (including all taxes) is in effect at a certain consuming point. The purchase price for the caustic soda is \$2.40 per 100 lb. NaOH. A straight line connecting these two points on the nomograph intercepts vertical line entitled "50% Liquid" at \$3.10 and the "73% Liquid" line at \$2.87. Cost differential is \$0.37 per 100 lb. or \$7.40 per ton, 100 percent NaOH. This margin of saving must be compared with the additional operating costs for handling 73 percent liquid caustic soda.—End



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New Construction

Proposed Work

Calif., San Leandro—Crown-Willamette Paper Div. of Crown Zellerbach Corp., 343 Sansome St., San Francisco, plans to construct a paper processing plant at West Ave. and Merced St. Estimated cost \$3,000,000

Fla., Pensacola—Chemstrand Corp., 1700 South 2nd St., Philadelphia, Pa., has acquired a 2,000 acre tract along the Escambia River and plans to construct a nylon plant. Estimated cost \$20,000,000

Ga., Rome—Mead Corporation, 118 West 1st St., Dayton, O., plans to construct a paper mill here. Estimated cost \$21,000,000

Ill., Chicago—Martin Oil Co., 131st St. and Kedzie Ave., plans to construct an oil refinery to have a daily capacity of 10,000 bbl. Estimate cost \$5,000,000

Michigan—Hooker Electrochemical Co., Niagara Falls, N. Y., is surveying the Western Michigan area. No definite decision has been made either as to the construction of a plant or a plant location. (Correction—status of project) June 1951 under Manistee, Mich.

Okl., Elk City—Shell Oil Co., Elk City, plans to enlarge its gas processing and recycling plant. Estimated cost \$3,000,000

Pa., Philadelphia—Barrett Div. of Allied Chemical & Dye Corp., Margaret and Bermuda Sts., Philadelphia, plans to triple the capacity of its synthetic phenol plant. Estimated cost \$8,000,000

Tex., El Paso—Standard Oil Co. of Texas, El Paso, plans to construct a plant for the production of heating oils, gasoline and diesel fuels; also a catalytic cracking unit. Estimated cost \$10,264,000 and \$5,500,000 respectively

Tex., Kingsville—Celanese Corporation, Kingsville, plans to expand its plants to produce paraformaldehyde, trioxane and formcel. Estimated cost \$3,500,000

Tex., Liberty—Texas Gulf Sulphur Co., Liberty, plans to increase the capacity of its sulphur plant. Estimated cost \$3,000,000

Tex., Odessa—Gilmore Refineries, Inc., c/o Earl B. Gilmore, 612 South Florida St., Los Angeles, Calif., plans to construct two refinery units to cost \$20,000,000 each

W. Va., Parkersburg—Eastern Rayon Mills, Cleveland, O., c/o Oscar Kohorn & Co., Architects, 501 5th Ave., New York, N. Y., plan to construct one 4 story and 1 one story manufacturing buildings here. Estimated cost \$9,000,000

Contracts Awarded

Del., Dover—Coty, Inc., Salisbury Rd., has awarded the contract for a cosmetics factory and office building to Enjav Construction Co., 105 West Madison St., Chicago 3, Ill. Estimated cost \$500,000

Fla., Jacksonville—Kieckhefer Container Co., 7200 Westfield Ave., Pennsauken, N. J., has awarded the contract for the construction of a kraft paper conversion factory on North Pearl St., Jacksonville, to S. S. Jacobs Co., Hildebrandt Bldg., Jacksonville. Estimated cost \$200,000

	Current Projects		Cumulative 1951	
	Proposed Work	Contracts	Proposed Work	Contracts
New England.....	88,000,000	86,100,000	\$15,000,000	\$4,647,000
Middle Atlantic.....	80,000,000	7,340,000	101,311,000	221,504,000
South.....	5,000,000	90,107,000	71,406,000	121,415,000
Middle West.....	65,264,000	6,086,000	264,220,000	301,893,000
West of Mississippi.....	9,000,000	90,000	30,688,000	29,210,000
Far West.....	132,012,000	99,794,000
Canada.....
Total.....	\$131,264,000	\$51,701,000	\$700,653,000	\$832,434,000

Fla., Tampa—Florida Portland Cement Co., Div. of General Portland Cement Co., 305 Morgan St., Tampa, has awarded the contract for an addition to Hooker's Point cement plant to Austin Co., 16112 Euclid Ave., Cleveland, O. Estimated cost \$315,000

Ill., Lincolnwood—Lind Plastics Products Corp., 4451 Rice St., Chicago 51, has awarded the contract for a factory here to Carl Wannen, Inc., 5377 North Bowmanville St., Chicago 25. Estimated cost \$125,000

Ind., East Chicago—Cities Service Oil Co., 70 Pine St., New York 5, N. Y., has awarded the contract for a fluid hydroforming unit with a daily capacity of 400,000 gal. to M. W. Kellogg Co., 225 Bway., New York 7, N. Y.

Ind., Lafayette—Eli Lilly & Co., East Georgia St., Indianapolis, has awarded the contract for the construction of Tippecanoe Laboratories and power plant to H. K. Ferguson Co., 1783 East 11th St., Cleveland, O. Estimated cost \$20,000,000

La., Lake Charles—Cities Service Oil Co., 70 Pine St., New York 5, N. Y., has awarded the contract for a fluid hydroforming unit with a daily capacity of 800,000 gal. to M. W. Kellogg Co., 225 Bway., New York 7, N. Y.

Mont., Laurel—Farmers Union Central Exchange, Inc., Hart-Albin Bldg., Billings, has awarded the contract for a catalytic cracking plant, topping plant, vacuum asphalt plant, gasoline concentration unit, polymer gasoline plant as addition to present refinery to Refinery Engineering Co., Wright Bldg., Tulsa, Okla. Universal Oil Products Co., Chicago, Ill., designed all units. Estimated cost \$3,000,000

N. Y., Mariners Harbor—Wallerstein Co., 180 Madison Ave., New York 16, N. Y., has awarded the contract for a laboratory building at 125 Lake Ave., to Wigton-Abbott Corp., 1225 South Ave., Plainfield, N. J. Estimated cost \$100,000

O., Chillicothe—Mead Corp., South Paint St., paper manufacturers, will construct a 2 story wood handling and treating facility building. Work will be done by separate contracts. Estimated cost \$4,900,000

O., Youngstown—Republic Rubber Div. of Lee Rubber & Tire Corp., 1940 Schultz St., has awarded the contract for an 80,000 sq. ft. plant addition including equipment, to George C. Murphy Construction Co., 519 Belmont Ave. Estimated cost \$2,000,000

Pa., Bristol—Minnesota Mining & Manufacturing Co., 900 Faquier Ave., St. Paul, Minn., has awarded the contract for a warehouse here to Turner Construction Co., 1500 Walnut St., Philadelphia. Estimated cost \$500,000

Pa., Danville—Merck & Co., 126 East Lincoln Ave., Rahway, N. J., has awarded the contract for a plant for the recovery of waste nitrogen oxides to Blaw-Knox Co., Chemical Plants Div., 321 Penn Ave., Pittsburgh, Pa. Estimated cost \$2,000,000

Pa., Neville Island—Pittsburgh Coke & Chemical Co., Grant Bldg., Pittsburgh, has awarded the contract for a blast furnace at its Pittsburgh Neville Island plant to Koppers Co., Koppers Bldg., Pittsburgh

S. C., Rock Hill—Celanese Corporation of America, c/o Daniel Construction Co., 429 North Main St., Greenville, contractor, will construct additions to several existing buildings. Estimated cost \$200,000

Tex., Bishop—Celanese Corporation of America, Bishop, has awarded the contract for a plant addition to Arthur Bros., Inc., Kingsville. Estimated cost \$1,350,000

Tex., Eastland—Lone Star Gas Co., 1915 Wood St., Dallas, will increase the capacity of its plant by 15,000 gal. per day. Work will be done by purchase and hire and subcontracts. Estimated cost \$375,000

Tex., El Paso—Standard Oil Co. of Texas, El Paso, has awarded the contract for a sulfuric acid alkylation plant to M. W. Kellogg Co., 225 Bway., New York 7, N. Y. Estimated cost \$1,000,000

Tex., Houston—Ethyl Corporation, Houston Ship Channel, has awarded the contract for a 2 story change house to Barber Plumbing Co., 1419 Paige St., Houston, at \$143,300

Tex., Lubbock—Lubbock Cotton Oil Mill, Lubbock, will construct an oil mill addition. Work will be done by owners. Estimated cost \$100,000

Tex., Lubbock—Plains Cooperative Oil Mill, Lubbock, will construct an oil mill and seed house unit. Work will be done by subcontracts. Estimated cost \$90,000

Wash., Seattle—Bardahl Manufacturing Corp., 1516 West 51st St., will construct a lubricating oil factory and warehouse. Work will be done by day labor. Estimated cost \$96,000

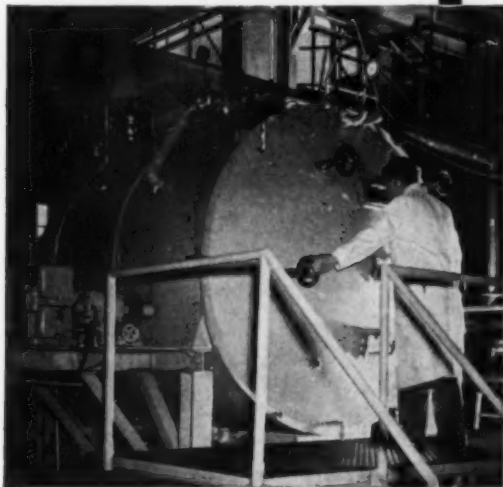
W. Va., Clarksburg—Rolland Glass Co., Clarksburg, has awarded the contract for a 1 story, 88x112 ft. plant addition to Washington Engineering & Construction Co., Oakland and Penna Ave., Washington, Pa. Estimated cost \$125,000

W. Va., Vienna—Libbey-Owens-Ford Glass Co., Nicholas Bldg., Toledo, O., has awarded the contract for plant additions to A. Bentley & Sons, 201 Belmont St., Toledo, O. Estimated cost \$1,500,000

Wis., Eau Claire—Sterling Pulp & Paper Co., Dells Dam, has awarded the contract for a 2 story, 58x223 ft. warehouse addition to Sneed & Market, 837 Bway., Eau Claire

A Headline that is also a Helpline!

Low-temperature drying for heat-sensitive products is performed on this sanitary type Stainless Steel Vacuum Double Drum Dryer installed in the BUFLOVAK Laboratory.



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Keep the vital parts of your motors dry—even when the full force of a hose is turned directly on them. Century Splash Proof motors eliminate production losses due to dripping or splashing liquids or falling solids. They also protect against rain, snow, sleet or hail on outdoor installations.

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3 to 25 HP Type SR Slip Ring Induction 3 Phase Splash Proof Motors.



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in chemicals and pharmaceuticals

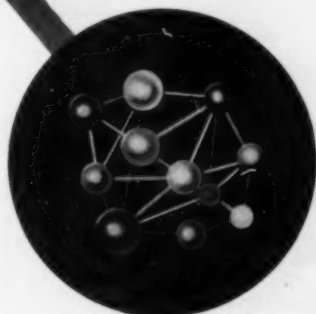
GAS

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component, combustible and conditioning atmosphere

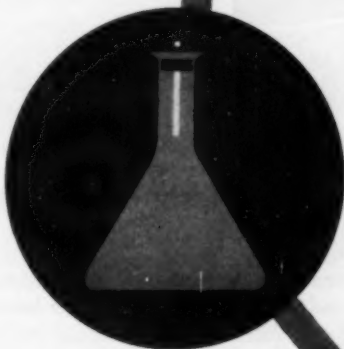
Few, if any other, natural mixtures play so vital a role in the chemical and pharmaceutical industries as does Gas.

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- sterilizing
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In a multitude of industries Gas gives up its elements in various processes, or is broken down into its essential components by one or another method, in the production of many materials such as



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- carbon black
- helium
- refrigerants
- solvents
- formaldehyde

Rapid progress in the extension of pipelines places Gas for chemical and pharmaceutical purposes within reach of most major industrial areas. Your

Gas Company Representative will help you use these nearby lines, or to locate plant facilities to take advantage of Gas for processing and production.

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CHEMICAL ENGINEERING—August 1951

287

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A revolutionary insulating and finishing cement that saves you time, labor, money!

Here's a new product of Eagle-Picher insulation research — an unusual mineral wool product that combines insulating and finishing material! It goes on in one easy-to-apply coat!

Saves you time, labor, money! It gives your equipment high thermal efficiency... cuts operating costs by saving fuel... and helps to provide perfect, precise control on temperatures.

It's composed of highly efficient ingredients, typical of which is famous, high-quality Eagle-Picher Mineral Wool. The "k" factor at 200 F. mean temperature is 0.50; dry coverage when mixed and applied as directed, 35 sq. ft., 1" thick (140 sq. ft., 1/4" thick) per 100 lb.

Packed in 50-lb. multi-wall Kraft paper bags.

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THE EAGLE-PICHER COMPANY

Insulation products of efficient mineral wool—for a full range of high and low temperatures. Technical data on request.

Since 1843





**ALLIS-CHALMERS
Centrifugal
Blowers**



Allis-Chalmers multi-stage blower with 5100 rpm steam turbine drive supplies 8000 cfm at 7 psig.

Driven at 3600 rpm by Allis-Chalmers motors, two single stage blowers in series supply 7200 cfm at 7 psig.

Speed Yeast Production

IN MODERN YEAST PRODUCTION, centrifugal blowers supply air for agitation during the growing process. Seen here are two different Allis-Chalmers blower installations for yeast agitation, both at one of the Milwaukee plants of The Red Star Yeast & Products Co.

While performing essentially the same duty, each servicing several large yeast vats simultaneously, the installations represent different solutions to the same application problem.

The steam turbine driven multi-stage blower (upper right) utilizes low pressure steam exhausted from reciprocating engines...energy that might other-

wise be wasted if the steam were sent directly to condensers! Output is adjusted by variable speed control.

Connecting the two single stage blowers in series (above) is an economical method of meeting the demand with induction motor drives. A multi-stage blower here would require gearing. Output control is by means of streamlined pre-rotation vanes at the first impeller inlet, giving efficient variable blower performance at constant drive speed.

When you have an application problem concerning air and gas handling equipment, consult Allis-Chalmers!

Whether your process calls for agitation, aeration, circulation, or combustion, A-C will meet your particular need from its complete range of equipment. Five separate types of blowers and compressors are built in a wide size and material range.

Allis-Chalmers assumes responsibility for the operation of a complete installation, supplying electric or turbine drives and automatic flow or pressure control. For detailed information, call your nearest A-C sales office or write to Allis-Chalmers, Milwaukee 1, Wis.

A-3481

ALLIS-CHALMERS



*Choosing emulsifiers may be like
hunting for a needle in a haystack—*

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you can make
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SINCE Atlas pioneered the HLB (Hydrophile-Lipophile Balance) System of choosing emulsifiers two years ago it has been developed constantly. Now, it includes not only HLB numbers for emulsifiers but for the materials to be emulsified: oils, fats, and waxes.

The Atlas HLB System saves hours of tedious experimentation . . . provides a practical guide for selecting the comparatively few surface active agents applicable to a particular problem calling for an emulsifier, solubilizing agent, detergent, wetting agent, or anti-foaming agent.

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ATLAS CHEMMUNIQUE

*Nothing Unusual About
Source of this Stearic*

Plenty of old hands at making and using stearic acid think our HYSTRENE® acids must be derived from special raw materials. Otherwise, how could we obtain such high purity—with virtually no "unsaps" (less than 0.2%) or "unsats" (I.V. is less than 0.5)! The answer lies not in the raw materials, which are only the usual animal and vegetable fats and oils—but in the exclusive Trendex Co. purification process. Result: Lighter-colored esters, soaps and condensates than ever before possible—with less darkening at high reaction temperatures.

New Emulsifier for High Gamma BHC

The air mail to and from Atlas research has been full of samples of high gamma (36% and 45%) BHC for many months now. That's because sprays made from the new high gamma products are rapidly gaining popularity for use against cotton insects, and Atlas has been developing an emulsifier for this toxicant. Our research has come up with a tailor-made emulsifier—Atlas G-2081. Commercial quantities are available.

Sorbitol—1000% Growth in Five Years!

Atlas production of sorbitol from corn sugar will soon be ten times its 1947 height—several hundred times the original plant started in 1937. That means a source of polyols that can be depended upon for expansion when defense and industry need it. The raw material is plentiful. The price trend for several years has been downward. Quantities for large-scale research are available on short notice.

*Trade Mark of Trendex Co., Mfr.

ATLAS

INDUSTRIAL
CHEMICALS
DEPARTMENT



ATLAS POWDER COMPANY, Wilmington 99, Del. • Offices in principal cities • Cable Address—Atpowco
ATLAS POWDER COMPANY, CANADA, LTD., Brantford, Canada

**A MESSAGE
TO AMERICAN
INDUSTRY**

**"This is more than a shortage
... this is an emergency.**

Every pound of your scrap is needed, NOW !"



"THE STEEL INDUSTRY is currently operating at more than 100% of rated capacity—turning out well over 2 million tons of steel per week. This record high production—every ton of which is in urgent demand—cannot be kept up unless we get more scrap from every potential source. For without your scrap we cannot produce enough steel. Today, every ton of steel turned out requires a half a ton of scrap for its production. That's why scrap—more scrap—is so urgently needed, and needed right away.

"The fact we have to face today is that steel mills are operating on a hand-to-mouth basis as far as scrap is concerned. Some mills are working on only a two-day supply of scrap. We already have had to shut down steel-making furnaces for lack of scrap.

"That's why we are asking you to strain every effort to get more scrap out of your plants and yards and on its way to the mills . . . to search out the scrap that doesn't come to market in normal times. You'll find this "dormant" scrap in obsolete equipment, tools and machinery that you haven't used for years . . . overlooked in your storage sheds . . . or rusting away in a junk pile in some forgotten corner. It's there. Turn it in at once—so we can turn out the steel you need. We can't do it without your help."

B. F. Taylor

President, United States Steel Corporation



UNITED STATES STEEL



Alcoa Heat Exchanger News



Published by Aluminum Company of America

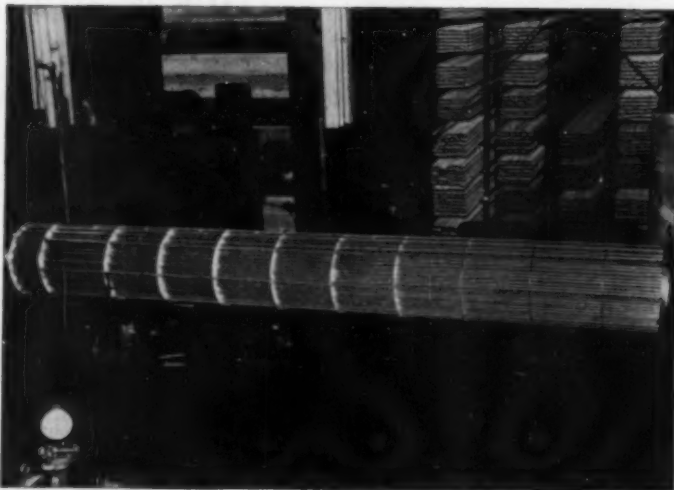
Rearmament needs severely limit the manufacture of aluminum heat exchanger tubes. But we realize that the purchase of refinery and processing equipment requires long study of economic and performance factors. That is the reason for this message.

El Paso Natural Gas Company Saves $\frac{1}{3}$ in Cost of Glycol-Amine Exchanger Tubes

About three years ago, the Fluor Corporation started investigation in corrosion problems occurring with steel exchanger tubes in gas-treating plants utilizing Fluor's glycol-amine process. They conducted extensive research to find suitable replacements for steel. (Results of these tests were reported in the April, 1950, and February, 1951, issues of "Petroleum Refiner" Magazine.) Aluminum and 4-6 cr., $\frac{1}{2}$ moly. steel tubes were most economical of the corrosion-resistant materials tested.

So when Fluor Corporation was selected to engineer glycol-amine exchangers at one of the large new plants of El Paso Natural Gas Company, they recommended Alcoa 3S-H14 aluminum tubes for the service. These tubes cost 30 per cent less than seamless mild steel and 60 per cent less than 4-6 cr., $\frac{1}{2}$ moly. steel. Fabrication of the units was done by Griscom-Russell.

Aluminum heat exchanger tubes have been so successful in resisting corrosion in glycol-amine plant service that over 100,000 pounds of aluminum are now used in that service. Experimental work has indicated over one year of service



with no sign of corrosion. In handling, shipping and fabricating costs, the aluminum tubes saved 200,000 pounds over the heavy metal tubes they replaced. Their greater ductility permits easier roll-in.

ALCOA OFFERS BOOKLET



This 24-page booklet will answer many of your questions about Alcoa Tubes. It covers fabrication techniques, alloy selection, chemical and petroleum applications. It describes tube cleaning, inhibitors, cathodic protection. It contains complete information on fluid flow and heat transfer. There are formulas, tables and specification data. Write for your free copy today. ALUMINUM COMPANY OF AMERICA, 1840H Gulf Bldg., Pittsburgh 19, Penna.

THESE APPLICATIONS ARE NATURAL FOR ALUMINUM TUBES:

Petroleum

Condensers handling hydrocarbon fractions such as gasoline, naphtha, gas, oil, etc.
Vapor recovery condensers
Lube oil coolers
Natural gas compressor after-coolers
TCC overhead condensers
Recompressor aftercoolers
Hydrogen sulfide gas coolers
Furfural condensers and heat exchangers

Propane chilling

Wax sweaters
Lean oil—rich oil exchangers
Amine solution coolers
Glycol-amine solution coolers and heat exchangers.

Chemical

Butanol
Ethanol
Ethylene Glycol
Glycerin
Hydroabietyl
Isopropanol

Methanol

Phenol
Propylene Glycol
Acetaldehyde
Formaldehyde
Furfural
Heptaldehyde
Acetic acid
Butyric acid
Stearic, Palmitic, Maleic Oleic acids
Naphtha
Ricinoic acid

Acetanilide

Ammonia
Hydrogen Cyanide
Nitric acid (concentrated)
Pyridine
Hydrogen Sulfide
Benzene
Dichlorobenzene
Gasoline
Gelatin
Hydrogen Peroxide
Turpentine
Xylene

You get a big **PLUS** ...

**...when you recover acid
the Simonson-Mantius way**

Rising sulfur prices ... the widening gap between demand and supply ... the growing need for sulfur conservation measures ... increasing local pressures ... any or all of these considerations may be causing you to re-study the acid disposal problem in your plant.

As you do this, consider what the Simonson-Mantius Vacuum Process offers you.

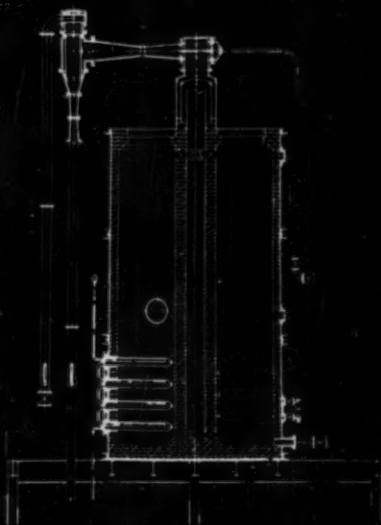
It offers you efficient, economical acid recovery. Your acid losses, due to entrainment and other causes, are cut to a minimum.



In addition, the Simonson-Mantius Process offers you this important plus: fumeless operation. Fumeless because it's effected under vacuum.

National Lead has been designing and building Simonson-Mantius acid recovery equipment for over a quarter of a century. The experience gained by our Acid Recovery Department in producing these units can be brought to bear on your particular recovery problem.

Our engineers will be glad to suggest a solution to you.



NATIONAL LEAD COMPANY
Acid Recovery Department



111 Broadway, New York 6, N. Y.

*Reg. U. S. Pat. Off.

DREW STEARIC ACIDS

FORMULA 200 Stearic Acid (65%)

Hydrogenated, distilled fatty acid equivalent to "double pressed stearic." It has a high titre, low iodine value and color and odor are excellent. Permits manufacturers to obtain a good, light color in the finished product at nominal cost. Widely used in non-ionic emulsifiers, metallic soaps and similar products.

FORMULA 300 Stearic Acid (70%)

Hydrogenated, distilled fatty acid equivalent to general types of "triple pressed stearic." It has exceptional color and odor, high stability and long shelf life. It's a premium grade for use wherever U.S.P., National Formulary and

similar specifications must be met. Used as an emulsifying agent for hand lotions, creams, deodorants, brushless shave creams, cleansing creams, cold creams, medicated creams, mascara, etc.

FORMULA 400 Stearic Acid (85-90%)

A special type of stearic acid with exceptionally high titre. It's an all vegetable, hydrogenated, distilled fatty acid with low iodine value and a titre of over 60°C. It is premium grade and used wherever specifications call for higher percentages of stearic acid content than those which are met by Formula 300 or 200.

Other grades of Stearic Acids also available

AVERAGE SPECIFICATIONS

exceptional color and long shelf life.					also available				
premium grade for use wherever									
U.S.P., National Formulary and									
AVERAGE SPECIFICATIONS									
PRODUCT		MYRISTIC (C ₁₄)	PALMITIC (C ₁₆)	STEARIC (C ₁₈)	OLEIC (C ₁₈)				
Formula 200		6.0%	20.0%	70.0%	4.0%				
Formula 300		6.0%	21.0%	70.0%	3.0%				
Formula 400		6.0%	6.0%	85.0%	3.0%				
Formula 1000		6.0%	20.0%	70.0%	4.0%				
Formula 1500		6.0%	20.0%	60.0%	14.0%				
PRODUCT		FFA	TITRE°C.	IODINE VALUE	ACID VALUE	SAP. VALUE	COLOR 5/16" Lovibond		
Formula 200		99-103	56-57	6.0 Max.	196.9-204.8	196.9-204.8	4.0/1.0		
Formula 300		99-103	58.0 Min.	4.0 Max.	196.0-204.8	196.9-204.8	4.0/1.0		
Formula 400		99-103	60-64	3.0 Max.	196.9-204.8	196.9-204.8	4.0/1.0		
Formula 1000		99.0 Min.	58	6.0 Max.	196.9 Min.	196.9 Min.	35.0/5.0*		
Formula 1500		99.0 Min.	54-56	15.0 Max.	196.9 Min.	196.9 Min.	35.0/5.0*		
*1" Cell									
Distilled and Fractionated Fatty Acids									
LINSEED OLEIC COTTONSEED									
LAURIC CAPRIC									
STEARIC CAPRYLIC									
VRO									
SOY SAFFLOWER COCONUT									



NEW FEON SELECTOR CHART

Helps you pick the right
synthetic cloth for your filter



No matter what your process or type of filter, this handy new folder will help you choose the cloth that will do your job best.

The samples give you a chance to check the actual weaves of these amazing new fabrics. Blow through them to test porosity . . . test the strength of the lightest nylon . . . feel the slick, non-blinding surfaces of the rotary-filter cloths, the springy resilience of the heavy press cloths.

The technical data and selector chart tell you which fabrics are best for specific chemicals, and at what temperatures . . . which are best for strength and wear-resistance . . . how they've been used in other plants to save money and speed production.

These facts weren't available in one place until Filtration Fabrics Division collected them. They're valuable additions to your files.

Write us on your company letterhead. We'll send your Selector Chart by return mail. And if you'll send the facts on your filtration job, we'll give you specific recommendations and prices for the synthetic cloths that will do most for you. Write today.

31-H

FILTRATION FABRICS DIVISION

FILTRATION ENGINEERS, Inc.

155 ORATON STREET, NEWARK 4, N. J.



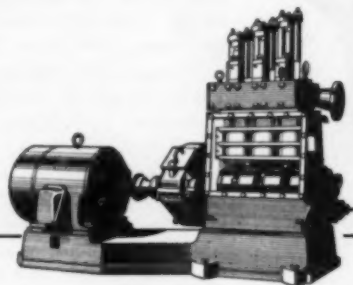
more horse-power per pound

Famous for stamina and a sure foot, the burro was a hard-working "pardner" of the old-time prospector. He's a little fellow—but he packs more horse-power per pound than any of his four-footed cousins...

This ability to get more work done with fewer pounds to do it is precisely what Aldrich Direct Flow Pumps have to offer. As a result of improved design, weight of the fluid-end is considerably reduced. And—whereas a speed of 150 rpm was formerly considered high for reciprocating pumps—these compact, Direct

Flow units are operating today at speeds of 500 rpm for the 3"; 360 rpm for the 5"; and 300 rpm for the 6" stroke. In each case, you get greater volume and higher pressure from a smaller pump: *you get more horse-power per pound.*

Among many liquids handled by Aldrich Pumps are: caustic solutions, fatty acids, nitric acid, acetic acid, aqua ammonia, anhydrous ammonia, as well as liquids encountered in the petroleum refining, petro-chemical, and other industries. Write today for Data Sheets on the Aldrich Direct Flow Pump you need.

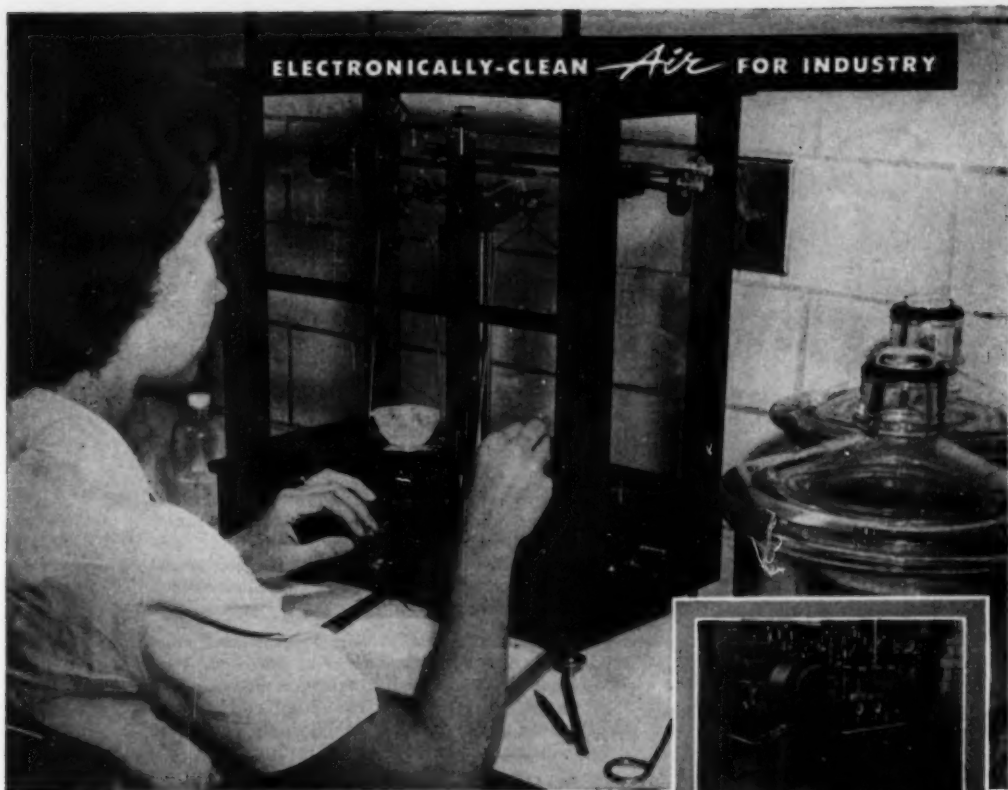


THE ALDRICH PUMP COMPANY

3 GORDON STREET • ALLENTOWN, PENNSYLVANIA

*...Originators of the
Direct Flow Pump*

Representatives: Birmingham • Bolivar, N. Y. • Boston • Buffalo • Chicago • Cincinnati • Cleveland • Denver • Detroit
Duluth • Houston • Jacksonville • Los Angeles • New York • Omaha • Philadelphia • Pittsburgh • Portland, Ore.
Richmond, Va. • St. Louis • San Francisco • Seattle • Spokane, Wash. • Syracuse • Tulsa • Export Dept.: 751 Drexel Building, Phila. 6, Pa.



M & R Dietetic testing lab, where clean, conditioned air plays a vital role.

HOW **SUPER-CLEAN AIR** GUARDS QUALITY AND PRODUCTION

Manufacture of baby foods requires exceptional standards of cleanliness. Every vessel must be sterile—and the air itself pure. M & R Dietetic Laboratories, makers of CEREVIM baby cereal and SIMILAC powdered infant food, insisted on *really clean* air. So PRECIPITRON®—the *electronic* air cleaner—was installed. Now they remove harmful contaminants so small that they can be seen only with the finest Ultra Microscope.

PRECIPITRON also increases production. In one separating process, 20% of the dried milk was once discarded because air-borne contaminants

passed through mechanical air filters. Now 100% is useable, and is better graded too. In the testing lab, precisely-controlled humidity and temperature help improve product uniformity and increase the efficiency of the technical staff.

There's a complete line of Westinghouse equipment to help you *put air to work*—with electronic air cleaning, air handling, or air conditioning. Contact your local Westinghouse-Sturtevant office, or write Westinghouse Electric Corporation, Sturtevant Division, Hyde Park, Boston 36, Massachusetts.

YOU CAN BE **SURE**...IF IT'S
Westinghouse



Westinghouse Hermetically-Sealed air conditioning compressors can be installed in an unventilated space.

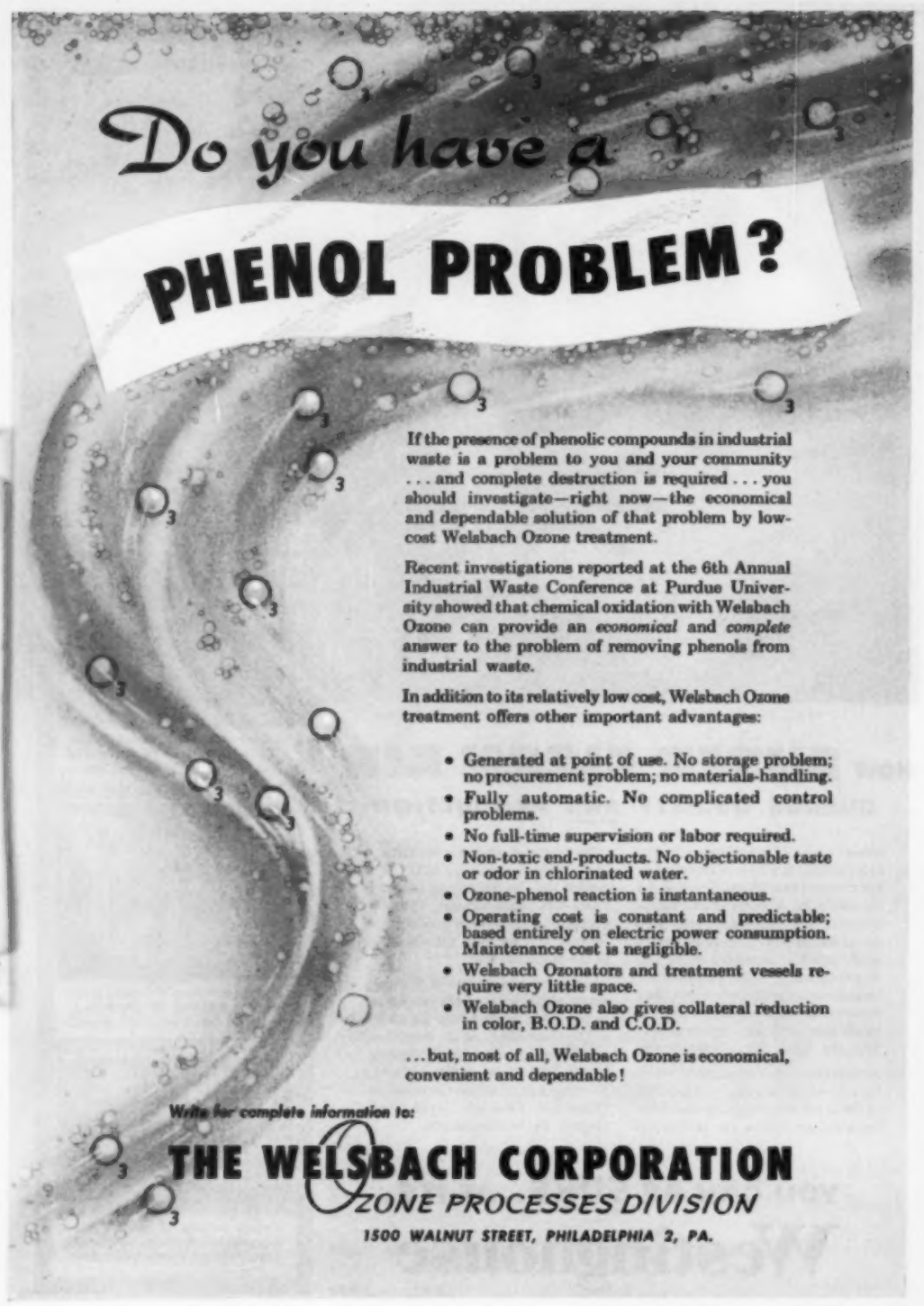


PRECIPITRON stops dirt *before* it enters the building. Its efficiency is triple the best mechanical cleaner.



There's nothing to remove from PRECIPITRON but dirt. It's periodically washed down drain with a water hose.

J-80229

The background of the advertisement features a stylized illustration of a river or stream. The water is depicted with various shades of gray and white, creating a sense of movement. Numerous small circles, representing bubbles or droplets, are scattered throughout the water. Several of these circles are labeled with the chemical symbol O_3 , indicating the presence of ozone. The overall aesthetic is that of a mid-20th-century technical or industrial publication.

Do you have a

PHENOL PROBLEM?

If the presence of phenolic compounds in industrial waste is a problem to you and your community . . . and complete destruction is required . . . you should investigate—right now—the economical and dependable solution of that problem by low-cost Welsbach Ozone treatment.

Recent investigations reported at the 6th Annual Industrial Waste Conference at Purdue University showed that chemical oxidation with Welsbach Ozone can provide an economical and complete answer to the problem of removing phenols from industrial waste.

In addition to its relatively low cost, Welsbach Ozone treatment offers other important advantages:

- Generated at point of use. No storage problem; no procurement problem; no materials-handling.
- Fully automatic. No complicated control problems.
- No full-time supervision or labor required.
- Non-toxic end-products. No objectionable taste or odor in chlorinated water.
- Ozone-phenol reaction is instantaneous.
- Operating cost is constant and predictable; based entirely on electric power consumption. Maintenance cost is negligible.
- Welsbach Ozonators and treatment vessels require very little space.
- Welsbach Ozone also gives collateral reduction in color, B.O.D. and C.O.D.

...but, most of all, Welsbach Ozone is economical, convenient and dependable!

Write for complete information to:

THE WELSBACH CORPORATION
OZONE PROCESSES DIVISION

1500 WALNUT STREET, PHILADELPHIA 2, PA.



OPERATION: FLEXIBILITY

A CLEAVER-BROOKS STEAM BOILER GIVES YOU:

- ✓ Quick, effortless response to fluctuating steam demands.
- ✓ Equally high efficiency (80%) operating with oil or gas.

Fluctuating steam loads are no problem when you have a custom-planned Cleaver-Brooks boiler in your plant. Whether your demand is heavy or light, steady or variable, these sturdy heavy-duty boilers respond instantly to your steam needs. Even with loads as low as 30% of rating, Cleaver-Brooks boilers operate with a flat 80% efficiency.

Cleaver-Brooks boilers burn either

oil or gas . . . either fuel is properly proportioned to meet your steam demand and need. No banking of fires or loss of valuable heat during low load periods. You benefit with lower fuel bills, less maintenance, reduced operating costs.

If you are considering a change in your present boiler plant—think about flexibility — and get the complete facts about Cleaver-Brooks custom-

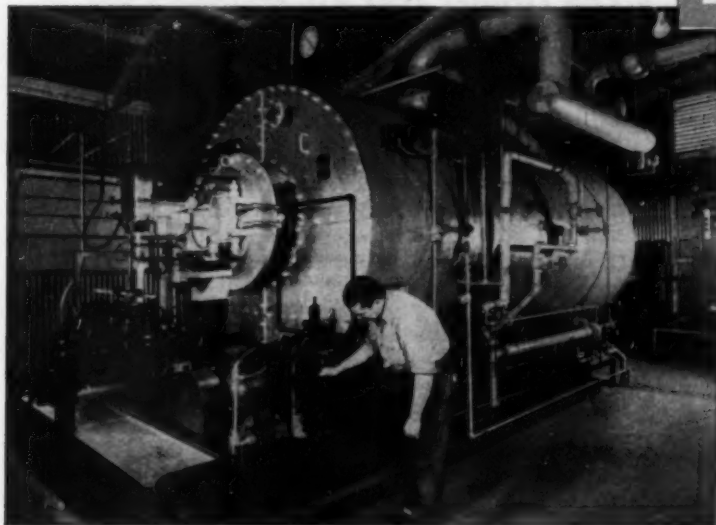
planned boilers. Cleaver-Brooks self-contained boilers 15 to 500 HP, 15 to 250 lbs., p. s. i. — oil, gas, combination oil and gas firing. CLEAVER-BROOKS COMPANY, 331 East Keefe Avenue, Milwaukee 12, Wisconsin.

Cleaver-Brooks

STEAM BOILERS
the first and finest of their class



Write for a
Cleaver-Brooks
Steam Boiler
Catalog.





Why Sunray standardized on Q.C.f. All-Welded Tank Cars...after 22 years of shipping experience!



This Q.C.f.-built Tank Car took severe punishment in a recent wreck. Not a drop of lading was lost thanks to Q.C.f. superior construction.

Ever since the late 'twenties, Sunray Oil Corporation had leased Q.C.f. Tank Cars.

As a lease-shipper, Sunray's shipping records were basically very simple. They boiled down to: *did the lading get there safely?*

The safe-delivery record set by Q.C.f. Tank Cars was good. So good that Sunray ordered only Q.C.f. cars, when they decided to operate their own tank cars!

• The Order: 200 All-Welded Cars

When Sunray ordered, they never lost sight of the extra safety of Q.C.f. Double Welding. Every inch of weld seam is stronger and more ductile than the parent metal. And X-ray testing proves every inch of tank-seam weld for all 200 Sunray cars!

There's a lesson for every shipper in Sunray's experience. Find out about the cost and safety advantages of Q.C.f. All-Welded Tank Cars. Write American Car and Foundry Company, 30 Church Street, New York, N. Y. Sales Offices in: Chicago • St. Louis • Washington • Cleveland • Philadelphia • San Francisco.

Q.C.f. ALL-WELDED TANK CARS
for Safe Delivery—

IDEA-CHEMICALS

... from Du Pont Polychemicals Department

HYDROXYACETIC ACID

makes a milder, safer cleanser

In the cleaning of dairy equipment, alkaline detergents were formerly used almost exclusively. But alkalies were not effective in the removal of milkstone, a hard milk residue. This and other problems were solved by the development of a better detergent using Du Pont Hydroxyacetic Acid. Properly formulated, detergents made with Hydroxyacetic Acid remove milkstone and effectively retard bacterial growth on the surfaces of the cans. And they leave no white film, odor, or carry-over of any kind.

Hydroxyacetic Acid's properties make it a valuable chemical for other industries, too—for example, wool dyeing, organic syntheses and metal-finishing operations. And they suggest many new applications. A few possibilities are: as a coagulant for raw latex, an ingredient of soldering flux, and as a reagent for developer solutions in photography.



Your business may find opportunities for profitable future use in Hydroxyacetic Acid... or in many of the other Polychemicals products. There are more than 100 of them—organic acids, amides, alcohols, ammonia, esters, resins, solvents, and plastics.

Although demand for many of these products now exceeds supply, we will gladly discuss the availability of experimental quantities for developmental work.

Write for technical booklet on Polychemicals products for your industry

Technical bulletins on Hydroxyacetic Acid and the chemicals and plastics used in your industry are available. Each product bulletin in the booklet presents physical and chemical properties, description, specifications, uses and possible applications, bibliography and other data. Write us on your business letterhead for your copy—and please tell us the name of your industry.

E. I. du Pont de Nemours & Co. (Inc.)
Polychemicals Department, 158E Nemours Building,
Wilmington 98, Delaware





make every bit of stainless count

Wise and efficient use of available stainless steel stocks can go a long way to making sure that all defense and industry needs are met.

Getting the best available materials for your job is a vital first step—Crucible, pioneers in the development of stainless steels, urges you to take full advantage of our metallurgical staff and stainless fabricating specialists. Their wealth of experience—based on thousands of stainless applications—can help stretch your stainless supply. There is no other metal that can work the same “miracles” as stainless, and these Crucible metallurgists can help you select the best available stainless grades for your needs.

It's up to you to make every bit of stainless count—we're equipped to help you do it. When your problem is stainless—call on us.

CRUCIBLE

first name in special purpose steels

51 years of *Fine* steelmaking

STAINLESS STEEL

CRUCIBLE STEEL COMPANY OF AMERICA, GENERAL SALES OFFICES, OLIVER BUILDING, PITTSBURGH, PA.

STAINLESS • REX HIGH SPEED • TOOL • ALLOY • MACHINERY • SPECIAL PURPOSE STEELS

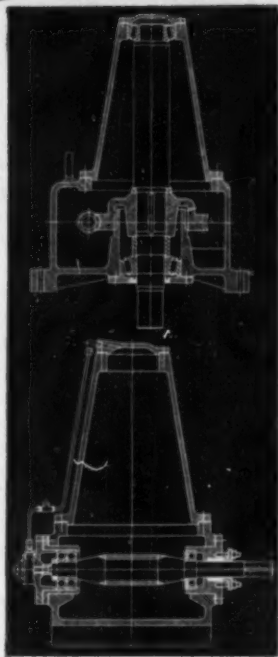


for long, unsupported VERTICAL OUTPUT SHAFT EXTENSIONS

Use the PHILADELPHIA
"STEEPLE" TYPE
WORM GEAR REDUCER

The exclusive Philadelphia "Steeple" type Vertical Worm Reducer was especially developed for the numerous Process Industries for driving: Agitators, Mixers, Circulators, Pumps, Washers—and other vertical type drives which call for sturdy, reliable speed reduction.

The wide bearing span insures rigidity for the extended shaft—the "dry-well" construction eliminates the necessity of a stuffing box on the vertical shaft. To insure positive lubrication of the upper bearing on the vertical shaft, an automatic reversing oil pump, together with a filter, is embodied within the unit housing. Write for full details on your Business Letterhead.



The views above illustrate cross sections through the worm and worm gear shafts. Note absence of stuffing box on vertical shaft (at top).

Philadelphia Gear Works, INC.

ERIE AVE. AND G ST., PHILADELPHIA 34, PA.
NEW YORK • PITTSBURGH • CHICAGO • HOUSTON • LYNCHBURG, VA.
IN CANADA: WILLIAM AND J. G. GREY LIMITED, TORONTO

Industrial Gears and Speed Reducers
Limitorque Valve Controls

Look to

Dow for

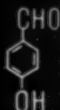
New available in commercial quantities, **p-HYDROXYBENZALDEHYDE** finds excellent use in making Anisic Aldehyde and other fine chemicals for the pharmaceutical and perfume industries.

This chemical is produced with Dow's characteristic high, uniform quality to give you the best results possible.

For technical assistance and pertinent information write:

THE DOW CHEMICAL COMPANY • MIDLAND, MICHIGAN

p-Hydroxybenzaldehyde



PROPERTIES

Pink powder with a faint, pleasant odor

Melting point 116.5°C.

SOLUBILITY (approximate)

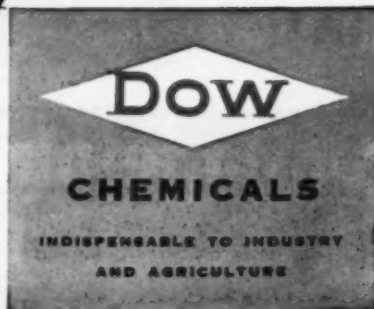
(grams per 100 grams solvent, at 25°C.)

Acetone	70
Alcohol	Very soluble
Benzene	4
Carbon tetrachloride	Insoluble
Ether	18
Methanol	90
Water	1
Water (at 80°C.)	Very soluble

Send for Experimental Sample
of p-HYDROXYBENZALDEHYDE

The Dow Chemical Company
Fine Chemical Sales
Midland, Michigan

Name _____ Title _____
Company _____
Address _____
City _____ State _____

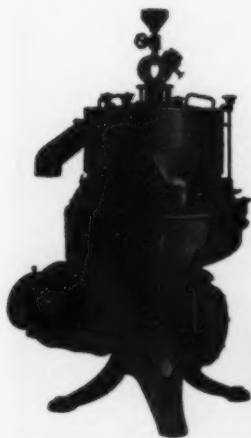


IT'S GOT TO BE *Continuous!*

No chance for a pause, here. And chemical processing must be continuous, too, if it is to be profitable. De Laval centrifugal machines speed up separation and clarification—twin bottlenecks in many otherwise fully continuous processes. They get rid of unnecessary interruptions—replace hours formerly required for settling or filtering with minutes or even seconds of centrifuging.

De Laval centrifugals for chemical processes have three basic applications: (1) continuous separation of two liquids, (2) continuous clarification of one or two liquids, and (3) continuous separation of two liquids plus the continuous removal of solids from one or both.

For each form of centrifugal separation De Laval has a specially designed machine. Several of these are available in different sizes and capacities. De Laval may already have tested materials similar to yours—consult one of their engineers.



IT'S

De Laval

FOR

the First Name in Centrifugals
the First Thought for **CONTINUOUS**
SEPARATION • CLARIFICATION • CONCENTRATION

THE DE LAVAL SEPARATOR COMPANY
165 Broadway, New York 6 427 Randolph St., Chicago 6
DE LAVAL PACIFIC CO., 61 Beale St., San Francisco 5
THE DELAVAL COMPANY, Limited, Peterborough, Ont.

BAKER PLATINUM LABORATORY WARE



NO more exacting tests could be applied to any product than those to which our platinum laboratory ware is subjected. The tests are continuous, because we maintain and operate large scientific laboratories and naturally employ our own laboratory ware in them.

The consequence is that any divergence from our high standards, any defect in manufacture, would show up inevitably.

All this makes it doubly safe for you to adopt Baker Laboratory Ware as standard equipment. You can't possibly go wrong in choosing it.

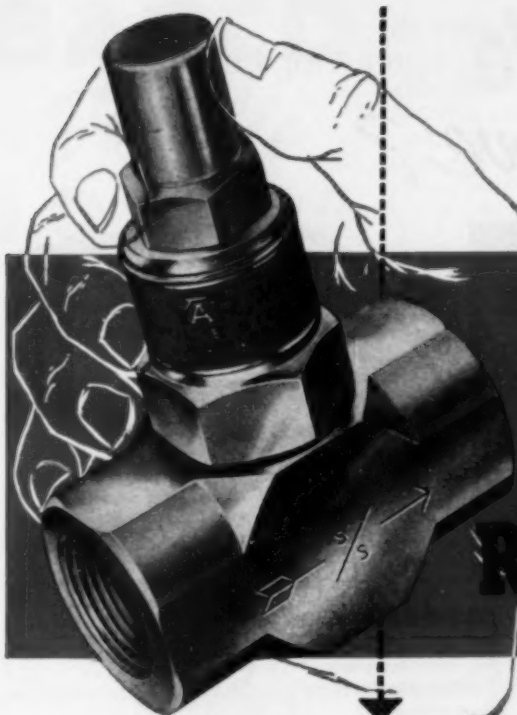
BAKER & CO., INC.

113 Astor St., Newark 5, N. J.

NEW YORK 7

SAN FRANCISCO 2

CHICAGO 2



BIG REDUCTION!

8-hour job now takes 4 hours

At a western magnesium reduction plant something besides magnesium has just been reduced. The steam at the end of the 1½ mile long steam line wasn't so hot—and neither was the production record of the plant at that location.

Then 26 old-type steam traps were replaced with Yarway Impulse Traps. Now there is only a 15° temperature drop from the boilers to the end of the line. *Most important, the plant 1½ miles from the boilers is now able to do work in 4 hours that previously took 8 hours.*

That's trap efficiency! It's evidence of the fact that Yarways are designed to send the most premium B.T.U.'s at top temperatures into your process or product. *They get equipment hotter, sooner . . . and keep it hot.*

Other Yarway features—small size, one moving part, easy installation, low maintenance, low cost, stainless steel construction. Nearly 750,000 Yarways have already been installed. For your Yarways, see a nearby industrial distributor . . . 216 stock and sell Yarways.

YARNALL-WARING COMPANY, 137 Mermaid Ave., Philadelphia 18, Pa.



FREE TRAP SELECTOR

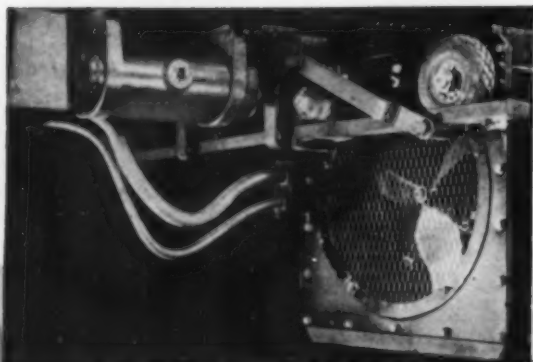
It's important to have the right trap in the right place. New 20-page selector tells quickly and easily which is the right Yarway trap for any application. Write for your free copy.



the steam trap

↓
designed with more production in mind

would a **flexible** connector help your
product "move"?



American asbestos-packed Flexible Bronze Tubing makes a flexible spout for this pistol type oiler made by the Plews Oiler Co.

rides the rods

These flexible refrigerant lines of American Seamless Bronze Tubing with a bronze protective casing permit this Waukesha Motor Co. railroad car air-conditioning unit to be rolled out for servicing and inspection. Pressure-tight and rugged, American Flexible Metal Connectors stand up under tough working conditions.

a flexible suggestion

In engineering your product: there's an American Flexible Metal Connector for every connector problem—for eliminating vibration, for cramped connections, for misaligned ports, for moving parts. Strong, tight and corrosion-resistant.

Write for Bulletins SS-50 and CC-300 to The American Brass Company, American Metal Hose Branch, Waterbury 20, Connecticut. In Canada: The Canadian Fairbanks-Morse Co., Ltd.

61228

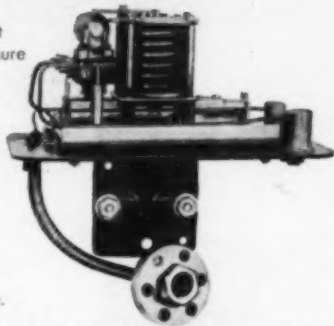


wherever connectors must move...

American FLEXIBLE METAL HOSE AND TUBING

modern coat of armor

This Taylor Instrument Co. "Transaire" Pressure Transmitter uses $\frac{3}{16}$ in. I.D. American Stainless Steel Tubing as a protective casing for the delicate capillary tubing connecting the volumetric pressure element with the instrument mechanism.



holds the curves

This Porta-Flex bench and machine light, made by Gardner Products Company, takes any curve and holds it. Its special heavy-duty American Steel Tubing remains both tight and flexible and withstands vibration. Base permits either vertical or horizontal mounting.



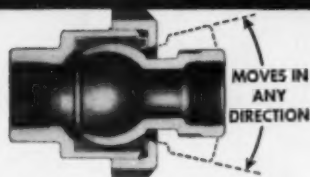
BARCO

Flexible JOINTS

to meet THE CHEMICAL INDUSTRY'S NEEDS

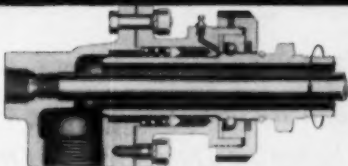
Wherever piping connections must move, look to BARCO for the ANSWER! Whatever your problem, Barco, invariably, can solve it BETTER, EASIER, and QUICKER with a tested and proven joint right out of the standard Barco line. This is because Barco builds a truly complete line of flexible ball, swivel, swing, and revolving joints—*there is a size and type for every purpose!* Submit your problem; ask for recommendations—Barco is at your service.

FLEXIBLE BALL JOINTS



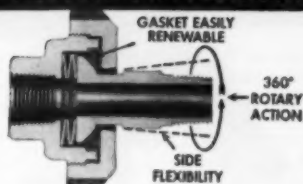
"One joint does the work of two or more!"—because it moves in any direction. Standard the world over where low cost, leakproof movable joints are needed in piping handling steam, air, water, oil, gas, or chemicals. Many models available. Up to 40° side flexibility plus 360° swivel action. Also used to facilitate quick connection of piping, overcome misalignment. Pressures to 6,000 psi; temperatures to 1,000° F. 15 different sizes, 1/4" to 12". Bulletin 215.

REVOLVING JOINTS



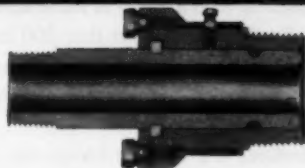
Minimum roll "drag" cuts power costs—up to 50% savings! Note wide spacing between bearings; inherent low torque little affected by pressure, speed, or temperature. Parts easily accessible. Light running action minimizes wear, permits free-floating installation. No adjusting necessary—long, leakproof service. Ratings to 250 psi (steam); 450° F. Single flow or syphon styles. Sizes 1/2" to 3". Wide choice of models; speeds to as high as 2,500 RPM. Bulletin 300.

ROTARY SWIVEL JOINTS



Exclusive angular motion prevents binding—only Barco offers this important advantage! Widely used for making compact, low torque swivel connections to reciprocating or rotating parts on platen presses, tire molds, oil burners. Easy to position piping accurately—no sagging, flopping lines. Leakproof, safe—pressure or vacuum. Ratings as high as 600° F., 3,000 psi (hydraulic). Sizes, 3/8" to 2"; angle or straight. Bulletin 265.

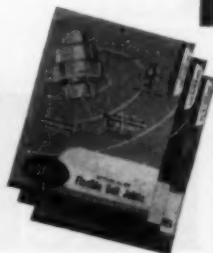
SWING JOINTS



Here is a simple, low cost, precision-built swing joint that is ideal for many applications: oil loading and unloading lines, hose reels, water connections. "O" ring gives leakproof seal. Full bearing surface, swiveling 360° in one plane only, supports normal piping. Built for hydraulic pressures to 1,000 psi; temperatures, -20° to 180° F. Male or female pipe thread connections, angle or straight. Sizes, 3/8" to 12". Ask for literature.

Send for NEW BULLETINS

For detailed information on Barco Joints, write for latest literature:
Bulletin 215: "Barco Ball Joints."
Bulletin 265: "Barco Swivel Joints."
Bulletin 300: "Barco Revolving Joints."
Bulletin: "Barco Swing Joints."



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The Only Truly Complete Line of Flexible Ball, Swivel, Swing and Revolving Joints

FREE ENTERPRISE—THE CORNERSTONE OF AMERICAN PROSPERITY

This 'dust' man can be your best friend

*Let him show you how you
can Reclaim the Values in
Escaping Dust—Wet or Dry*

If valuable dust is escaping from your plant, you're overlooking an opportunity to attain top overall efficiency.

How to recover this dust loss...how to exploit its full value, is Buell's job. That's why so many plant operators include us among their best business friends.

Looked up to as a leader in the science of dust collection, Buell draws on more than 200 man-years of experience in the design and construction of high-efficiency, economical-to-operate collector equipment.

Therefore, if a valuable-escape-dust problem exists in your plant, probably we can help. For full information about Buell techniques and methods write today. Ask for the new 'Dust Recovery' bulletin. Buell Engineering Company, Dept. 12-H, 70 Pine Street, New York 5, N. Y.



'SF' Mist Precipitator
boosts production in
acid manufacture.

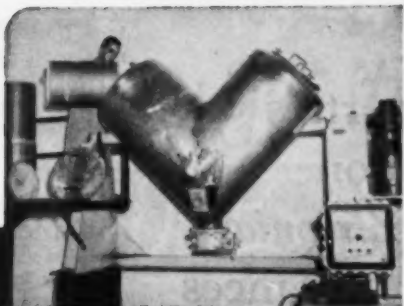
C. E. ROSENBERG, A. R. P. S.

buell



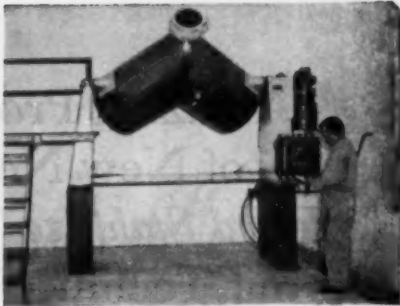
HIGH-EFFICIENCY CYCLONES
ELECTRIC PRECIPITATORS
'LR' COLLECTORS
LOW DRAFT LOSS COLLECTORS
SPECIAL PURPOSE COLLECTORS
DUST HOPPER VALVES

ENGINEERED EFFICIENCY IN DUST RECOVERY

K**SAVES
TIME****PROMOTES UNIFORMITY for GANE'S chemicals**

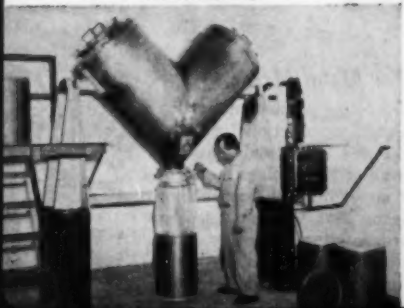
Convenient loading

Dustless discharge



Thorough blending

Easy cleaning



When executives of Gane's Chemical Works, Inc., Carlstadt, N. J., witnessed a laboratory test of the **p-k** Twin Shell Dry Blender, they were immediately impressed by its possibilities. Now—a 20-cu. ft. stainless steel blender is in constant operation, blending phenobarbital and similar drugs where no variation in lot batches can be tolerated. The **p-k** Twin Shell requires an average of only 10 to 15 minutes for a complete blend to absolute uniformity as compared with from 4 to 5 hours previously required in other blending equipment, without guarantee of uniformity.

Loading and discharging time has been reduced—cleaning is simplified by

the smooth polished interior surface and absence of baffles in the **p-k** Blender. **p-k** Twin Shell Blenders mix dry materials faster and more uniformly than any other blender. Operating capacities range from 1 to 250 cubic feet; speeds from 6 to 29 rpm.

p-k will be glad to run an experimental blend of your materials to demonstrate timing for thorough blending. There is no obligation—and the results will introduce you to an entirely new and widely accepted method of dry blending.

Send for Catalogs 401 and 402 for further information on both the laboratory and production models.

Mixers • Coolers • Kettles • Agitators
Nitroators • Reboilers • Autoclaves
Condensers • Evaporators • Sulfonators
Brine Heaters • Brine Coolers
Freon Coolers • Soap Crutchers
Ribbon Blenders • Fuel Oil Heaters

Vapor Condensers • Lube Oil Coolers • Lube Oil Heaters • Reaction Vessels • Instantaneous Heaters
Quenching Oil Coolers • Storage Heaters
Refrigerant Condensers • Twin Shell Blenders*

*Patented

the **R**

Patterson-Kelley Co.,

INC.

22 Lackawanna Ave.

East Stroudsburg, Penna.

1011

101 Park Avenue, New York 17 • Railway Exchange Building, Chicago 4 • 1700 Walnut Street, Philadelphia 3 • 96-A Huntington Avenue, Boston 16

CHEMICAL ENGINEERING—August 1951

311

Amazing Properties of New Norton Fused Stabilized Zirconia Permit Technical Advances in Processing

None other like it! No other refractory offers such an unusual combination of properties as new Norton Fused Stabilized Zirconia.

Its resistance to high temperature — its low thermal conductivity, despite its relatively heavy weight — its great strength at elevated temperatures — its resistance to oxidizing and reducing atmospheres at high temperatures — its chemical inertness — and its amazing electrical resistivity all combine to make a refractory that promises revolutionary advances in the processing field.

For Metal Melting

For processing precious metals in high frequency induction furnaces, Norton Fused Stabilized Zirconia crucibles or cement linings are ideal because metal does not wet them. This means that you can use the same furnace interchangeably without contamination of different alloys. What's more, Fused Stabilized Zirconia permits 100% recovery of melt from furnace linings. And you can depend on it for long life. It is unaffected by operating tempera-

tures from 3200° to 3600° F. in metal melting furnaces.

For processing ferrous alloys, too, the non-wetting property of Norton Fused Stabilized Zirconia permits its use in many pouring and melting operations.

For Chemical Processing

Fused Stabilized Zirconia is first choice on operations where excellent insulating and refractory properties are required, such as burner tunnels and furnace linings in combustion chambers. It withstands temperatures as high as 4500° F. In addition to its high temperature resistance, its low specific heat and low conductivity make it profitable on certain gas synthesis operations. Its chemical inertness also makes it valuable on certain types of processing where this property is important.

For Ceramics

Fused Stabilized Zirconia is highly recommended as setter tile for firing ceramic bodies such as barium titanate dielectrics and piezoelectrics, and some ferro magnetics. It does not react with or discolor ware. And its long life and thermal shock resistance make it particularly desirable for lining high temperature kilns and for fired shapes and grain in insulating all types of furnaces. It replaces carbon products in neutral and oxidizing atmospheres and is preferred for thermal insulation in molybdenum and platinum wound furnaces.

Write for further information

For complete data on further applications and detailed description of the new Norton Fused Stabilized Zirconia, ask your nearby Norton representative for Form 1409, or send coupon below.



Some of the many refractory shapes made of Norton Fused Stabilized Zirconia are pictured here.

NORTON COMPANY

507 New Bond Street, Worcester 6, Mass.

Gentlemen:

Please send me without obligation Form 1409 describing Norton Fused Stabilized Zirconia. I'm interested in investigating its use for:

- | | |
|---|---|
| <input type="checkbox"/> Lining Furnaces or Reactors | <input type="checkbox"/> Batts for Firing Titanates |
| <input type="checkbox"/> Metal Melting | <input type="checkbox"/> Electric Heater Elements |
| <input type="checkbox"/> Thermal Insulation (Other applications)..... | |

Name.....

Title.....

Company.....

Address.....

City..... Zone..... State.....



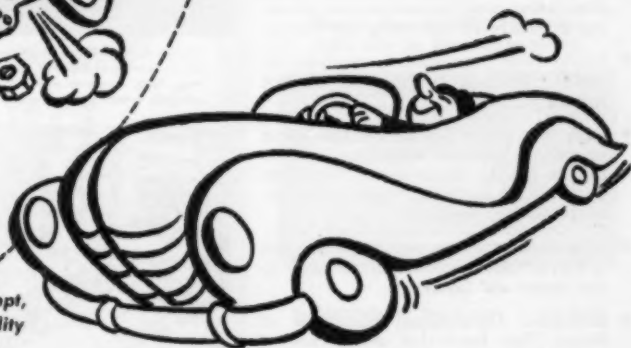
Special REFRACTORIES

Making better products to make other products better

Canadian Representative
A. P. GREEN FIRE BRICK CO., Ltd. TORONTO, ONTARIO

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DOES make a difference



When you place your order with Barrett you're assured prompt, dependable service and top quality products, backed by 97 years of successful manufacturing experience.

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Indene Resin
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*Reg. U. S. Pat. Off.

6 Reasons Why Leading Refiners Are Switching to KAYLO HEAT INSULATION

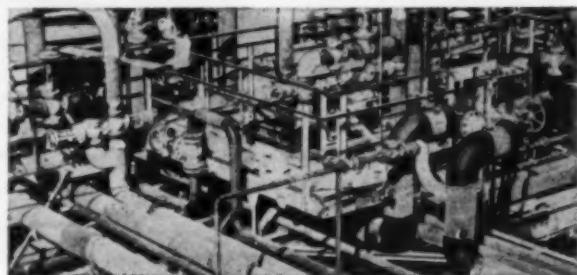
Through demonstrated superiority, Kaylo Heat Insulation is rapidly becoming recognized as the first basic advancement in the high temperature field in many years. Compare these advantages:

- Kaylo Heat Insulation is a calcium silicate (not glass)—an inorganic material which retains its stability in long service under severe conditions;
- Kaylo Heat Insulation has a wide effective temperature range—up to 1200°F.—eliminating need for combination covering in nearly all operating conditions;
- Kaylo Heat Insulation is insoluble in water. Work is not delayed by wet materials;
- High strength of Kaylo Heat Insulation practically eliminates spoilage both in transit and in application. Workmen can walk on insulated equipment without breaking insulation;
- Light weight along with high strength of Kaylo Heat Insulation makes application easier and faster;
- Simplified Dimensional Standards of Kaylo Pipe Insulation permit use of double layers for the higher temperatures without the use of special materials.

It will pay you to investigate the advantages offered by Kaylo Heat Insulation.



Applications of Kaylo Heat Insulating Block and Kaylo Pipe Insulation, The Texas Company Refinery, Lawrenceville, Illinois. M. W. Kellogg Company, New York, Designer and Builder. New construction includes units for fluid catalytic cracking, fractionation, gas recovery and catalytic polymerization.



For complete details on Kaylo Heat Insulation, write Dept. N-181, Owens-Illinois Glass Company, Kaylo Division, Toledo 1, Ohio.



KAYLO ... first in calcium silicate

...pioneered by OWENS  ILLINOIS Glass Company

MAIN OFFICE: TOLEDO 1, OHIO—KAYLO SALES OFFICES: ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND
DETROIT • HOUSTON • MINNEAPOLIS • NEW YORK • OKLAHOMA CITY • PHILADELPHIA • PITTSBURGH • ST. LOUIS • WASHINGTON

12,500,000 TONS HANDLED...



was just a start for Rex Idlers

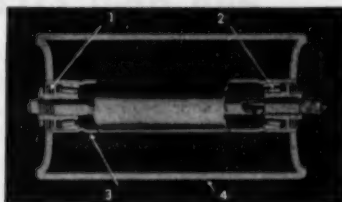
You'd think that carrying 12,500,000 tons of material would be a lifetime job for any belt conveyor idlers. After these rugged Rex Idlers handled that amount of aggregate for the Shasta Dam as a starter, the same idlers were installed on the longest, highest belt slope conveyor in regular service. And they're still going strong.

That's real proof that Rex Belt Conveyor Idlers give you lowest cost service . . . that they eliminate costly down time caused by premature idler failures. Not only do Rex Idlers last longer, they also are easy on the belt. They eliminate destructive belt pinching and creasing, and absorb practically no power. Special application idlers, such as Rex Impact Cushioning Idlers illustrated above (lower right hand corner), installed under loading points, protect belt from laceration and carcass failures.

For the complete story on these cost-cutting idlers, mail the coupon for your copy of Bulletin No. 463R.



These Rex Quality Features Add Life to Your Conveyors



- 1** Triple labyrinth grease seal . . . dust stays out, grease stays in.
- 2** Tapered roller bearings, deadshaft type mounting, oversize capacity.
- 3** Unit mounting for bearings for positive alignment and minimum friction.
- 4** Heavy duty one-piece welded steel construction for maximum roll life.

CHAIN-BELT COMPANY
1648 West Bruce Street
Milwaukee 4, Wis.

Gentlemen:
☐ Send me my copy of Bulletin No. 463R.
☐ I would like to see a Rex Field Sales Engineer.

Name.....

Company.....Dept.....

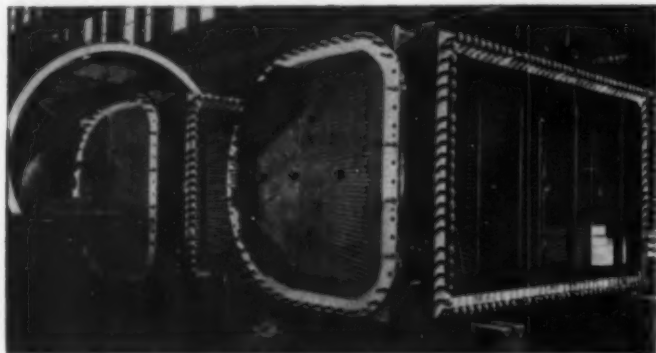
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City.....State.....

BRIDGEPORT BRASS COMPANY
CONDENSER AND HEAT EXCHANGER TUBE EDITION
COPPER ALLOY BULLETIN



MILLS IN BRIDGEPORT, CONN. AND INDIANAPOLIS, IND.—IN CANADA: NORANDA COPPER AND BRASS LIMITED, MONTREAL



Installing tubing in two 7,500 sq. ft. Surface Condensers.
Courtesy Allie-Chalmers Manufacturing Co.

90-10 Cupro Nickel Condenser and Heat Exchanger Tubing

During the present emergency many users of 70-30 and 80-20 cupro nickel tubing will be faced with the problem of selecting suitable substitutes for these excellent alloys. This is in keeping with the defense program which calls for conservation of nickel for military needs.

Fortunately, for the past few years much work has been done in determining the relative merits of cupro nickel alloys with lower nickel contents. The most promising is 90-10 cupro nickel containing 1% to 1.75% iron. This alloy shows good corrosion resistance in flowing sea water, the iron acting as a corrosion inhibitor. It compares very favorably with 70-30 cupro nickel containing 0.5% iron.

Applications Growing

Appreciable quantities of 90-10 cupro nickel have already replaced Admiralty condenser tubes in surface condensers of power plants using salt water for cooling purposes. Results to date have been very encouraging.

- Where 90-10 cupro nickel has been tried out in oil refineries, it has shown superiority over Admiralty from the circulating salt water side although it is not as satisfactory as Admiralty when in contact with hydrogen sulphide and similar components. Admiralty has been the standard alloy for oil refineries for many years, but there has been a move towards changing to more impingement resisting alloys especially among refineries located on the seaboard. Aluminum brass, Duralumin IV (aluminum bronze), and 70-30 cupro nickel are now quite common for handling corrosive harbor waters.

In beet sugar evaporators 90-10 cupro nickel has also proven superior to brass, Admiralty, and aluminum brass on the vapor side, which is quite corrosive.

Offsetting Impingement Corrosion

Like the higher-nickel content alloy,

(Advertisement)

90-10 cupro nickel shows fine resistance to impingement corrosion which is one of the enemies of condenser tube life. Impingement corrosion thins the metal especially at the entrance end of the tubing for a distance of possibly six or eight inches. Sometimes the attack extends throughout the tubes or is localized anywhere along the length of the tube.

The brunt of the impingement attack is at the mouth of the tubing where it receives the full impact of the circulating water. Sea water is a more active solvent than fresh water. The higher the water speed, the more severe the attack.

Effect of Velocity

Some alloys are more sensitive to impingement attack than others. Admiralty brass, which stands up nicely against circulating sea water at low velocities such as four feet per second, may fail rapidly when the water velocity is raised to seven feet per second and higher. The practice of using higher water velocities explains why there is a trend away from Admiralty, which does not stand up well under such conditions. Aluminum brass withstands impingement corrosion better than Admiralty and all of the cupro nickel alloys are also far superior to Admiralty against this type of attack.

In the interest of conservation of materials as well as the investment itself, it pays to give close attention to the selection of the alloys which will give the longest service life and minimum shut-down time. As time goes on, the experience gained from accumulated records of condenser tube behavior pays big dividends. We appreciate the cooperation of operating engineers which has enabled our Corrosion Laboratory to help with corrosion problems.

(7113)



That manifold distributes DRY air to all the tanks in this Cities Service farm. The Lectrodryer that does this DRYing automatically is located in a small building right in the center of the tanks.



DRY air blankets oil in storage

A Lectrodryer feeds DRY air into the manifold that distributes it to all the tanks. Automatic control maintains pressure on the manifold so that, as oil is drawn from the tanks, this air rushes in to take its place.

Thus Cities Service prevent contamination of their lubricating oils with moisture—a practice that's carried on at the refinery, aboard the ships transporting the oil, and here at Cicero, Illinois. Lectrodryers do that DRYing at all these points.

Whatever your moisture problem—in air, gases or organic liquids—there's probably a standard Lectrodryer able to solve it. Our engineers will advise you on DRYing methods and equipment, saving you time and money. Their experience covers every industry.

For this DRYing help, write Pittsburgh Lectrodryer Corporation, 303 32nd Street, Pittsburgh 30, Pennsylvania.

**LECTRODRYERS DRY
WITH ACTIVATED ALUMINAS**

LECTRODRYER

REGISTERED TRADEMARK U. S. PAT. OFF.

In England: Nitel, Limited, Tyburn Road, Erdington, Birmingham.
In Australia: Nitel, Limited, 51 Parramatta Road, Glebe, Sydney.
In France: Stein et Roubaix, 24 Rue Erlanger, Paris XVI.
In Belgium: S. A. Belge Stein et Roubaix, 320 Rue du Moulin, Brussels-Linge.



New catalytic cracking unit in an Ohio Refinery. Plant equipped with Burgess-Manning Gas and Air Line Snubbers, Exhaust Snubbers, and Flue-Gas Discharge Snubbers.

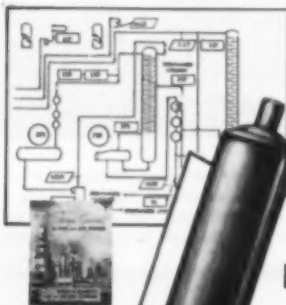
● On engines and compressors used in many stages of refinery process ... from the crude oil storage tanks ... desalter ... distillation column ... catalytic cracker ... you will find Burgess-Manning exhaust Snubbers, intake Snubbers, gas and air line Snubbers, flue-gas discharge Snubbers ... these Snubbers reduce engine exhaust and compressor intake noises to the desired level, and reduce pipe line surging.

● Specialists in Surge Control in Gas and Air Piping

To keep pace with new needs in the petro-chemical industries, Burgess-Manning has broadened its research during the past few years to develop a special Snubber capable of reducing surging in compressor gas and air piping systems ... practically eliminating resultant vibration ... simplifying metering. Call in Burgess-Manning engineers, today.

BURGESS-MANNING COMPANY

749 East Park Avenue, Libertyville, Illinois



Write for new booklet, "Surge Control."

Burgess-Manning Gas and Air Line Snubber.

OTHER PETROLEUM APPLICATIONS

• Oil and Gas Production • Oil and Gas Well Repressuring and Recycling • Gas Transmission and Distribution • Manufactured Gas Industry • Petro-chemical Process Industry.

From well head through the refinery gate ... it's Burgess-Manning

For Prompt Service
Contact Our New
Engineering & Sales Office
Burgess-Manning Company
1203 Dragon Street
Dallas, Texas



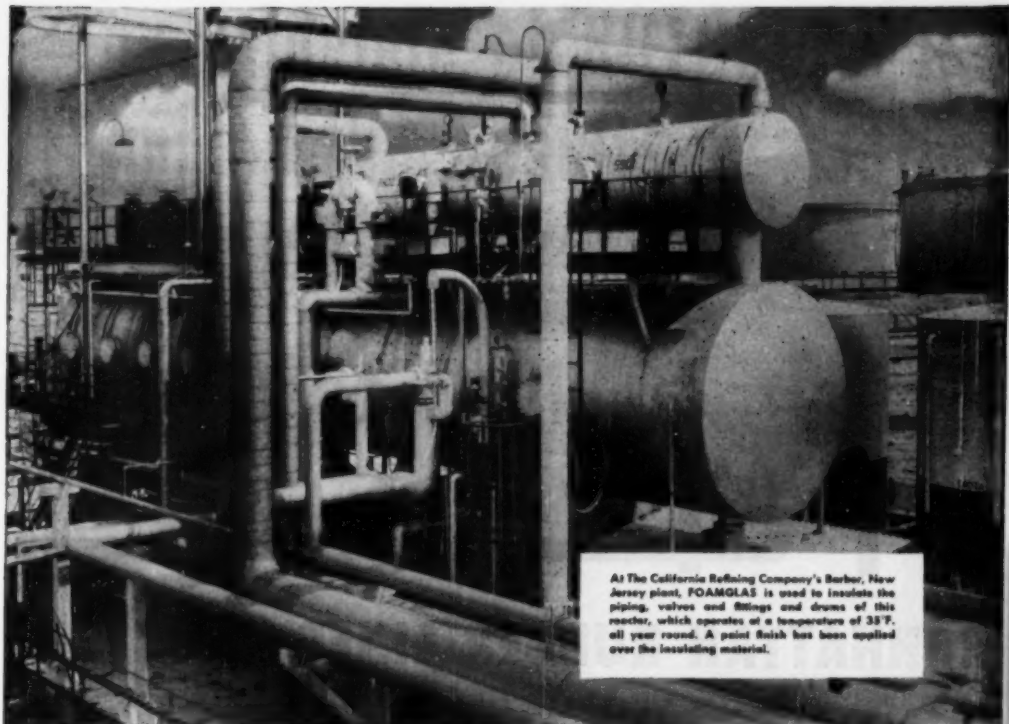
Oklahoma refinery equipped with Burgess-Manning Exhaust and Gas and Air Line Snubbers.



▲ Texas Refinery. Burgess-Manning Snubber installed on flue-gas blow off.

Michigan Refinery equipped with ▼ Burgess-Manning Snubbers.





At The California Refining Company's Barber, New Jersey plant, FOAMGLAS is used to insulate the piping, valves and fittings and drums of this reactor, which operates at a temperature of 35°F. all year round. A paint finish has been applied over the insulating material.

Save cold cash . . . when the heat is on!

● It takes an exceptional insulating material to keep this processing equipment operating at near-freezing temperature in hot summer weather. Yet FOAMGLAS is handling the job—and countless others like it—effectively and economically.

Its unique physical properties enable this cellular glass insulation to give long lasting, satisfactory service on tanks, drums and towers, on indoor and outdoor piping, valves and fittings, on heat exchangers, evaporators and other processing equipment in many prominent refineries and processing plants.

When you are concerned with keeping temperatures—and insulating costs—at low levels, be sure to look into the possibilities of FOAMGLAS, the cellular glass insulation. Write for free sample and informative booklet.

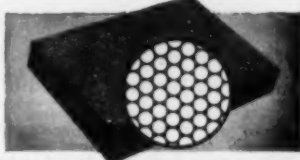
PITTSBURGH CORNING CORPORATION
PITTSBURGH 22, PA.



FOAMGLAS®

the cellular glass insulation

When you insulate with FOAMGLAS — the insulation lasts.



The best glass insulation is cellular glass. The only cellular glass insulation is FOAMGLAS. This unique material is composed of still air, sealed in minute glass cells. It is light weight, incombustible, verminproof. It has unusually high resistance to moisture, chemicals and many other elements that cause insulation to deteriorate.

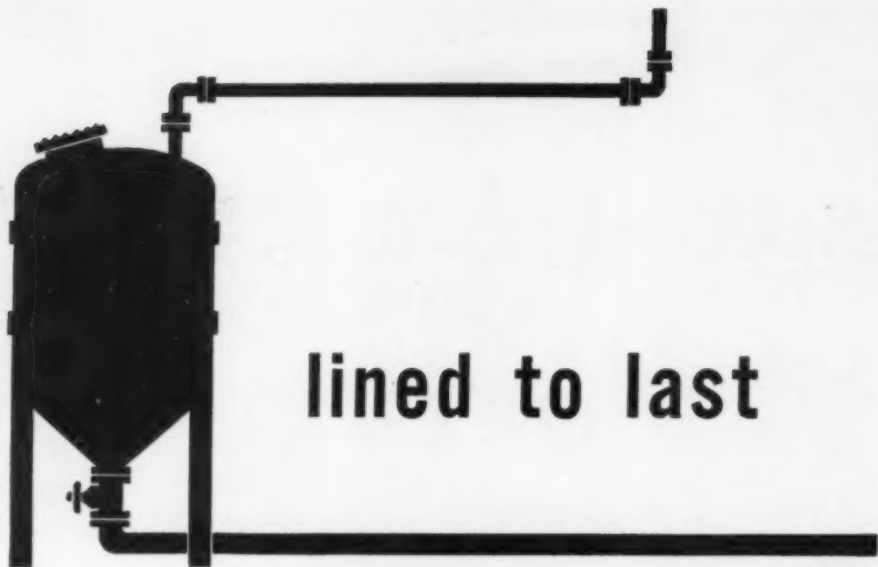
Pittsburgh Corning Corporation
Dept. CC-81, 307 Fourth Avenue
Pittsburgh 22, Pa.

Please send me without obligation your FREE booklet on the use of FOAMGLAS for industrial insulation, and a sample of the material.

Name.....

Address.....

City.....State.....



lined to last

MANHATTAN RUBBER LINED TANKS

"Manhattan linings don't come loose . . ."

This is the first reason users give for selecting Manhattan to rubber line tanks, pipes, fittings and valves . . . a permanent bond of rubber to metal.

Manhattan rubber linings will expand and contract with the metal under temperature changes without separating. In fact, physical pull-tests show that Manhattan linings will break within themselves before they separate from the metal. This is the assurance you want . . . a job that is "Lined to Last".

There are, of course, other qualities that make Manhattan rubber linings your best investment, whether you are protecting chemical processes or electroplating equipment from corrosion and contamination. For full details write for Tank Bulletin MR 557 and Pipe Lining Bulletin 6907.



RUBBER LINING PLANTS AT PASSAIC, N. J. AND NORTH CHARLESTON, S. C.



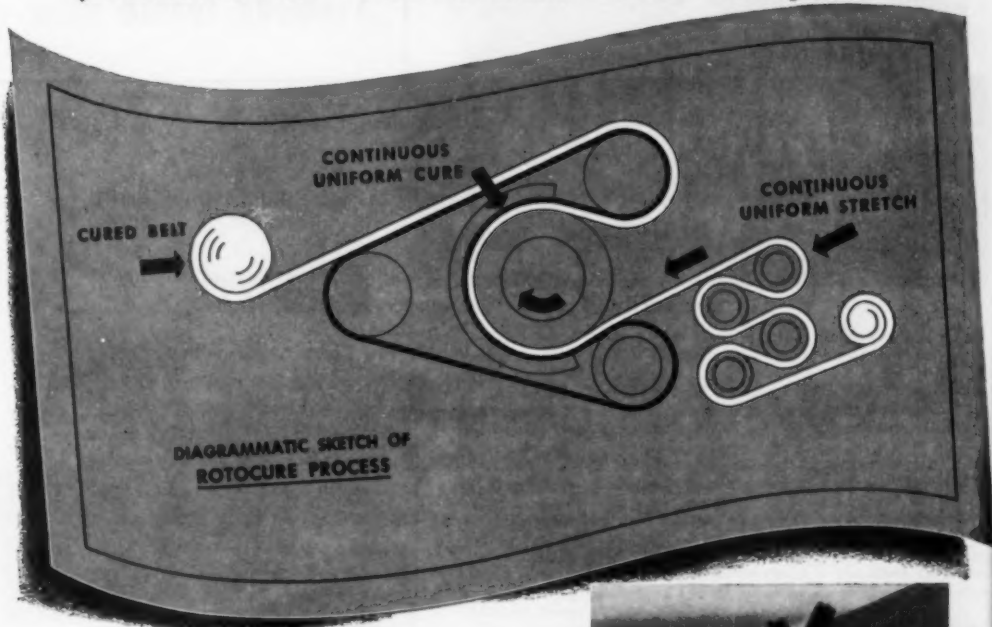
MANHATTAN RUBBER DIVISION — PASSAIC, NEW JERSEY

RAYBESTOS-MANHATTAN, INC.

Manufacturers of Mechanical Rubber Products • Rubber Covered Equipment • Radiator Hoses • Fan Belts • Brake Linings • Brake Blocks • Clutch Facings • Packings • Asbestos Textiles • Powdered Metal Products • Abrasive and Diamond Wheels • Bowling Balls

The Principle of ROTOCURE is Simple—the Results Dramatic

(Eliminates OCS*—killer of Conventional Conveyor Belts)



Place a hot flatiron too often on the same spot of a pair of pants and you weaken the fabric. Use conventional flat press methods of curing belting and *you weaken the structure similarly*. Flat press curing cannot help but result in these overcured segments because these sections (2" to 4" long across the belt width) get a double "treatment" as previously cured areas advance *less than a full press length*.

Not so with ROTOCURE. In this *continuous* method of vulcanization double curing due to press overlapping is eliminated because the belt is in constant uniform motion. Product-wise you get these vital advantages:

1. Increased belt flex life — as much as 40%
- ... 2. Elimination of mechanical distortion at the press ends ... 3. Constant, uniform stretch



*Overcured Sections — present every 30' to 40' in all belts made by the flat press method. Only RotoCuring (continuous, non-stop curing) eliminates this major cause of belt failure.

... 4. Uniform, abrasion-resistant covers.

These product advantages are paying off for BWV Conveyor belt users in more work hours per belt, savings per ton in materials conveyed and rock bottom maintenance costs. Are *you* one of them? If not, ask your BWV distributor or write us direct.**

**At the same time, get the story on BWV rotocured transmission belts which permit operation at lower tensions.



Another Quality Product of

BOSTON WOVEN HOSE & RUBBER COMPANY

Distributors in all Principal Cities

PLANT: CAMBRIDGE, MASS. • P. O. BOX 1071, BOSTON 3, MASS. U. S. A.

How do chemists react in the lab?

Take any number of chemists or development engineers. Circulate in the average laboratory. Expose to variable heat and humidity.

Reaction, you well know: Logy feeling. Short temper. Low efficiency.

Why cook *yourself* in your lab? With Carrier Air Conditioning you'll feel better, think better and get better results.

Better results? Why sure, it just stands to reason that when air is clean . . . and humidity controls standardize moisture pick-up . . . you'll get more reproducible results.

They found out at Sinclair, at Corn Products and in many other laboratories that Carrier Air Conditioning pays off. Call or write. We'll show you which system is the best for you. Carrier Corporation, Syracuse 1, N. Y.

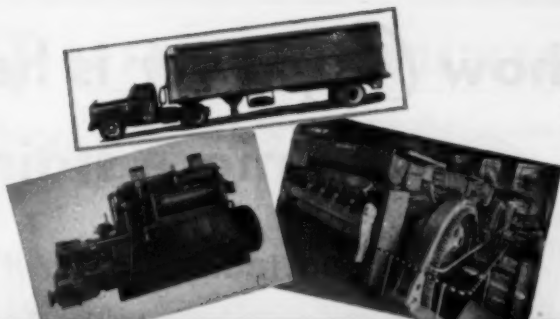
Carrier

AIR CONDITIONING
REFRIGERATION
INDUSTRIAL HEATING

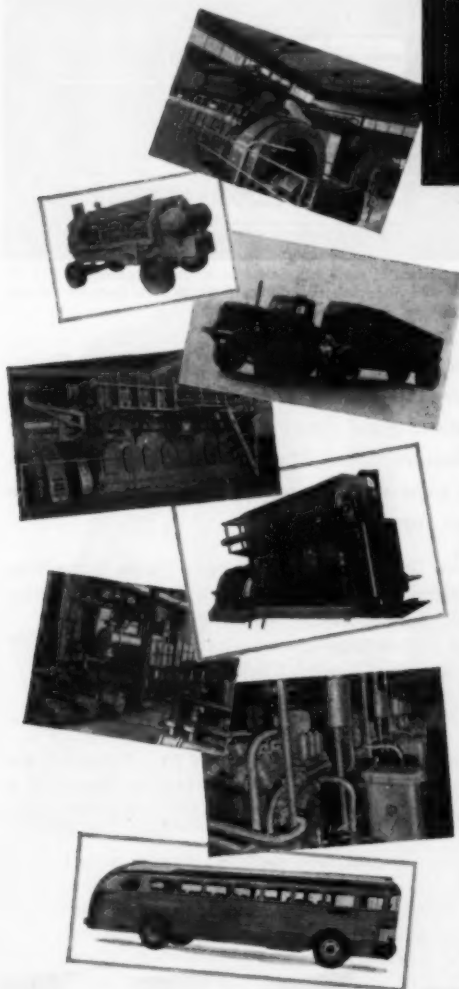


Modern research laboratory at Sinclair Refining Company, where Carrier Air Conditioning is considered essential to research.

**a big
selling point
with diesel builders**



**and a big buying point
with diesel users**



Unobserved on many a Diesel, yet vital to its performance . . . the exchangers entrusted with the critical responsibility of lube oil or jacket water cooling, or both.

And because that component can help build a Diesel's reputation for sustained operating efficiency, or quickly cancel it through its own inadequacy, engine builders are and *must* be extremely discerning in their selection.

That's why today, as for years past, on most every Diesel installation, you'll find either built-in to the engine itself, or located in a convenient spot, a *Ross Exchanger*. It's standard with the best names in the industry . . . names like Caterpillar, Nordberg, Cummins, Cooper-Bessemer, Fairbanks-Morse, Worthington, Ingersoll Rand and others . . . names that have reputations to protect in the factory, on the farm . . . on pipelines, in power plants . . . in mines, on mine-sweepers . . . in oil drilling and oil refineries . . . in cotton gins and chemical plants, utilities, on ski lifts, to mention a few.

Yes, consistently you'll find Ross Exchangers relied upon to carry the burden of temperature protection for engines of any rating. They're a big selling point with Diesel engine builders . . . a big buying point with users. And as you may expect, like most Ross units, they're fully standardized, saving considerable in design problems, engineering, fabrication and installation. Full details in illustrated bulletins, on your request.

ROSS HEATER & MFG. CO., INC., Div. of American Radiator & Standard Sanitary Corp., 1411 West Ave., Buffalo 13, N. Y., In Canada, Horton Steel Works, Limited, Fort Erie, Ont.

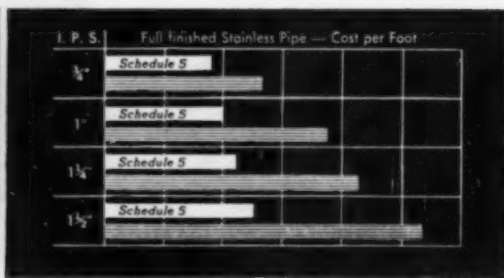


Serving home and industry

AMERICAN STANDARD • AMERICAN RADIATOR • CHILDS PUMPS • DETROIT • EXCHANGERS • Kewanee Motors • ROSS HEATER • TORONTO • EON

how *Carpenter* is helping industry get more stainless pipe

—even today, when it's tough to get!



Comparison of costs with Schedule 40 shows savings of 10% to 45% with *Schedule 5*. Additional savings on costs for valves, fittings, etc. are also possible.

What Carpenter *Schedule 5* Pipe Is—

Its **LIGHT WALL** gives more feet of pipe for every pound of Stainless Steel. Cost is 40% to 50% lower. Larger I.D. increases flow area and permits use of a smaller pipe size.

You now have a way to help us improve the availability of Stainless Pipe for essential uses. And you can do it at a terrific saving in your costs.

You can hook up *Schedule 5* Pipe with existing lines of tubing or heavier wall pipe, Schedules 10 and 40.

For most jobs Carpenter *Schedule 5* Stainless Pipe handles the working pressures with a good margin of safety. Any working pressure up to 150 psi is handled by this pipe. In pipe sizes under 1 1/2", higher pressures are frequently used.

More Stainless Pipe for essential uses is possible, even under today's conditions. To get the full story, call your nearest Carpenter Stainless Tubing Distributor. Or, write for a copy of the new "*Schedule 5* Data Sheets". We will be glad to send you a set.



THE CARPENTER STEEL COMPANY
Alloy Tube Division, Union, N. J.

Export Department: Carpenter Steel Co., Reading, Pa.—"CARSTEELCO"

Carpenter

STAINLESS TUBING & PIPE

Analysis

Tolerance

Finish

— guaranteed on every shipment

August 1951—CHEMICAL ENGINEERING

STURTEVANT ROTARY FINE CRUSHERS

**Crush or
Granulate
to Fine, Even
Sizes without
Excess Dust...**



Cross section view illustrating the crushing action

These rugged crushers speed output of fines, cut reduction costs. Desired fineness is quickly obtained by regulating hand wheel. "Open-door" accessibility permits fast, easy cleaning. They crush fine . . . crush fast and do not clog. Available in output capacities from 1 to 30 tons-per-hour. Write for catalog.

STURTEVANT MILL COMPANY

100-A CLAYTON STREET, BOSTON 22, MASSACHUSETTS

Designers and Manufacturers of: CRUSHERS • GRINDERS • SEPARATORS • CONVEYORS
MECHANICAL DENS and EXCAVATORS • ELEVATORS • MIXERS

CLIP AND MAIL COUPON TODAY

Sturtevant Mill Company
101-A Clayton Street
Boston 22, Massachusetts

Gentlemen:

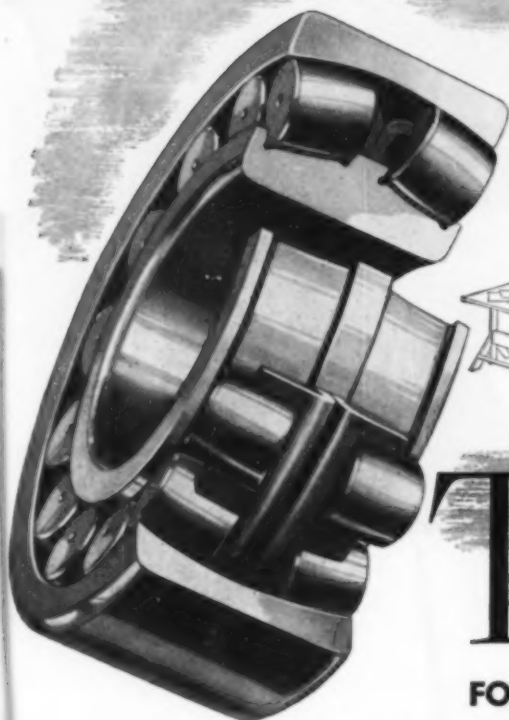
Please send me catalog describing
your Rotary Fine Crushers. I am inter-
ested in crushing _____

Name _____

Street _____

City & State _____

Firm _____



**CHEMICAL EQUIPMENT
ENGINEER**



**SKF
BEARING
ENGINEER**

TEAM

FOR EFFICIENCY AND ECONOMY

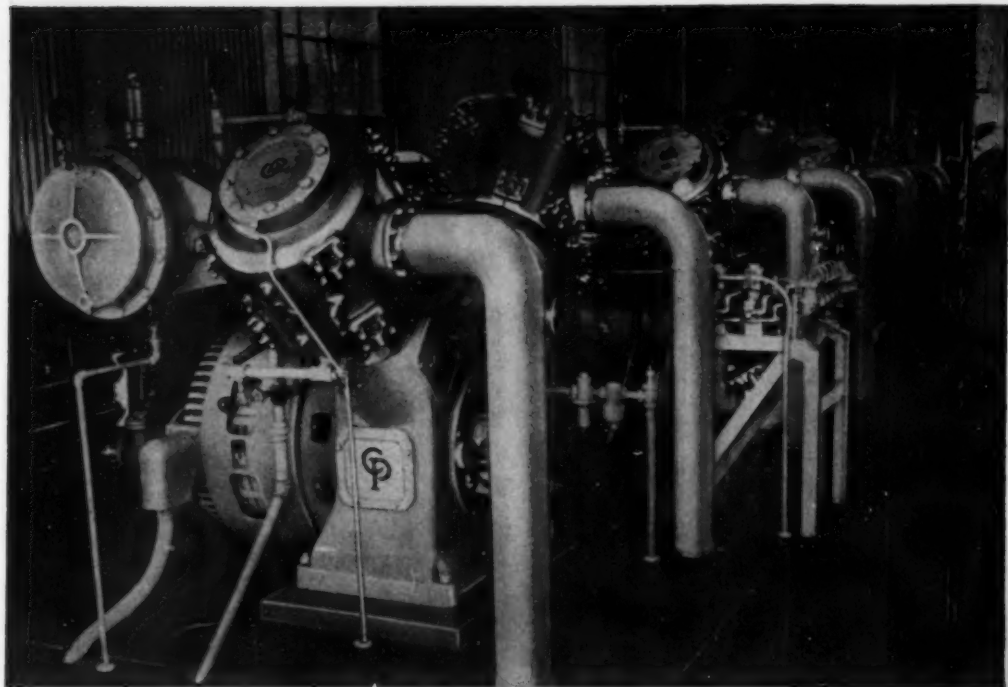
Over the years, **SKF** engineers have worked closely with engineers and designers in every field of industry. This co-operation, this *team-work*, has helped industry minimize friction in all types of equipment from the smallest motors to the largest blooming mills. Whether you are designing new equipment or looking for efficient, economical replacement bearings, look confidently to **SKF** for expert, proved advice. Depend on **SKF** to help you put the right bearing in the right place. 7270-G



WHY SKF IS PREFERRED BY ALL INDUSTRY

integrity • craftsmanship • metallurgy
tolerance control • surface finish
product uniformity • engineering service
field service

SKF INDUSTRIES, INC., PHILADELPHIA 32, PA.—manufacturers of SKF and HESS-BRIGHT bearings.



FOR HEAVY DUTY

COMPACT, EASILY INSTALLED TYPE Y COMPRESSOR



Where floor space is limited, and continuous, heavy duty service is required, the Type Y Compressor is ideal. Available with direct-connected, flange-mounted synchronous or squirrel cage motor.

The Type Y Compressor is easy and inexpensive to install, requiring only a simple foundation. No aligning or leveling is necessary.

CP features that assure high efficiency and low maintenance include large area Simplate valves, multi-step capacity regulation, effective inter-cooling, precision bearings and force-feed lubrication.

Built in sizes from 75 h.p. to 250 h.p., 501 c.f.m. to 1663 c.f.m.; available also with belted and coupled motors.

Write for Bulletin 766



**CHICAGO PNEUMATIC
TOOL COMPANY**

General Offices: 8 East 48th Street, New York 17, N. Y.

PNEUMATIC TOOLS • AIR COMPRESSORS • ELECTRIC TOOLS • DIESEL ENGINES
ROCK DRILLS • HYDRAULIC TOOLS • VACUUM PUMPS • AVIATION ACCESSORIES

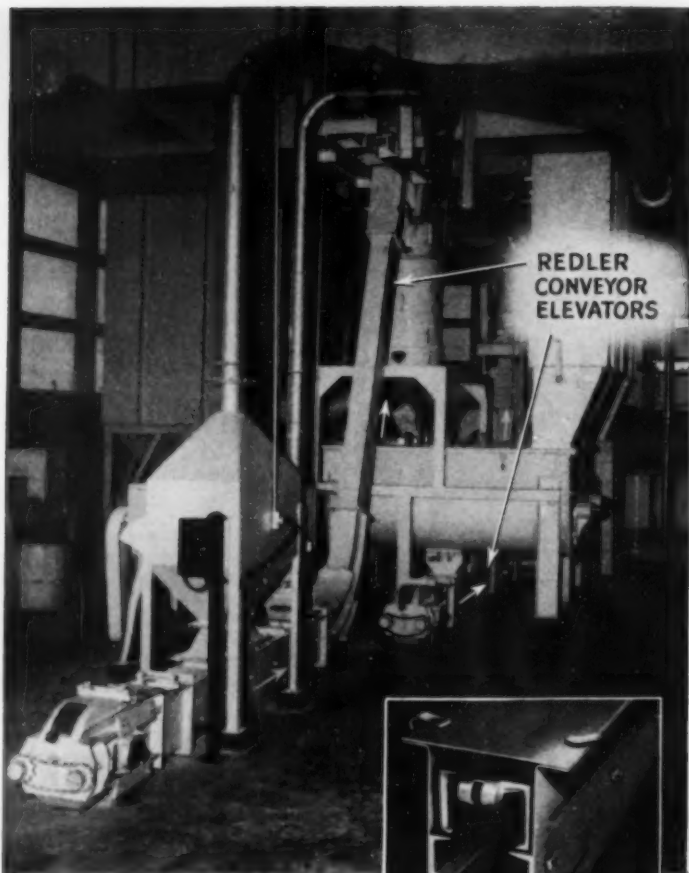
4

Powder Handling Problems that found One Answer

...a REDLER Conveyor-Elevator System

The materials handled in bulk at this plant are talc, face powder and talcum products which imposed these special requirements: Bulk handling equipment to fit limited space—Dust-free conveying—Protection against contamination—Lowest handling costs. A REDLER installation, that fits neatly and snugly, and completely encloses the moving material was the perfect answer to all requirements.

Because of their great flexibility in design and adaptability to space, REDLER Conveyor Systems settle many such problems for plants of widely differing operations. Designed and built by S-A engineers, they provide fast, convenient handling for many materials with maximum safety and economy. S-A engineers will gladly talk over your requirements and offer helpful suggestions based on 50 years experience in conveying bulk materials.



Cross-section of standard Redler casing shows material moving in lower tier—flights returning, circuit-fashion, in upper.

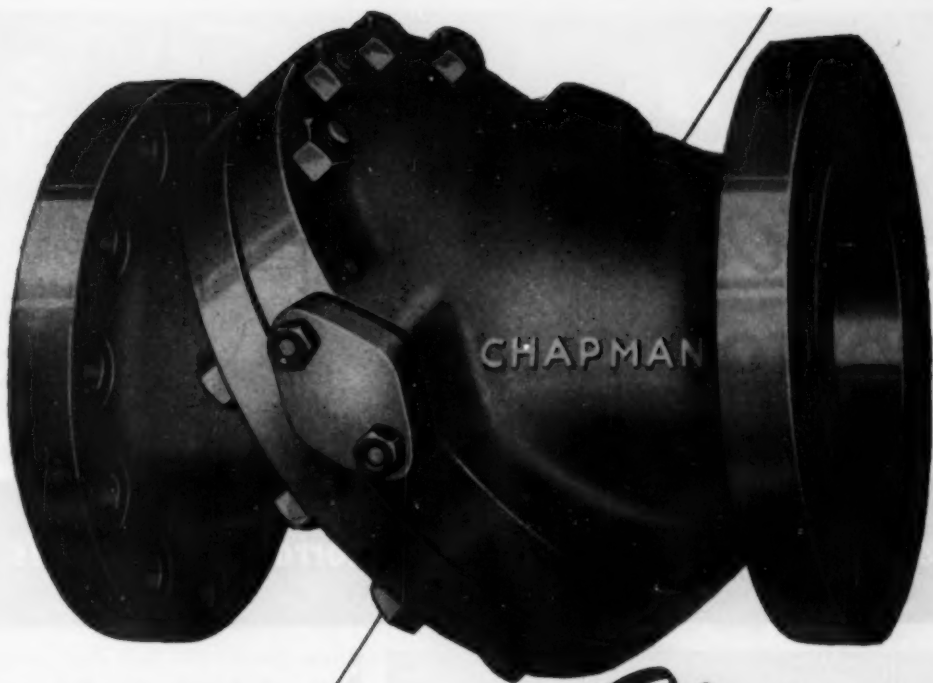
CRUSILLAS Y COMPANIA, S. A.
Havana, Cuba

Two REDLER Conveyor-Elevators handle the full output—each serving as a feeder, conveyor and elevator in a single unit. Lower feed section (foreground of large photo) receives material from a feeder and elevates it for discharge to mixer. Sifted materials discharge into mixers from which they are drawn off by a second REDLER Conveyor-Elevator—then discharged to pulverizer and filled into batch boxes for delivery to packing operations. The dust-tight, enclosed REDLER casing keeps materials clean, safe and pure against contamination and avoids spillage.

50 years experience
STEPHENS-ADAMSON
1901-1951 with bulk handling
MFG. CO.

3 Ridgeway Avenue, Aurora, Illinois Los Angeles, Calif. • Belleville, Ontario

DESIGNERS AND MANUFACTURERS OF ALL TYPES OF BULK MATERIALS HANDLING EQUIPMENT



YOU GET

Cushioned Closing

WITH

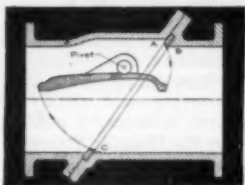
CHAPMAN

TILTING DISC CHECK VALVES

There's no impact on closing — with this valve by Chapman. The balanced disc rides the flow smoothly — uses the fluid or gas itself to cushion the closing action. The disc lifts away from the seat easily on opening; closes quickly, positively—yet quietly.

Consequently, there's no rubbing on the seats—little wear on hinge pins and bearings. Repair needs are at a minimum — maintenance costs low.

Chapman Tilting Disc Check Valves are available in either iron or steel. Write today for catalog with complete technical information.

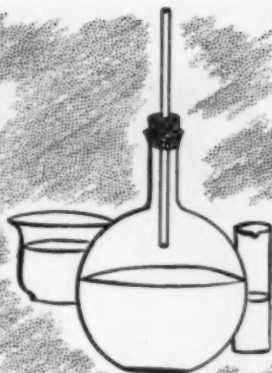


Cross-section of the Chapman Tilting Disc Check Valve illustrating the way that the balanced disc is supported on the pivot, with arrows showing the travel of the disc. A feature of the design is that the disc seat lifts away from the body seat when opening, and drops into contact when closing, with no sliding or wearing of the seats.

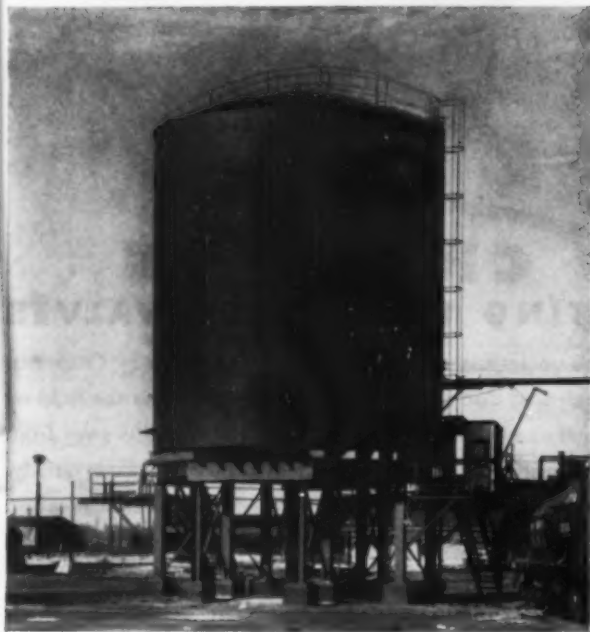
The Chapman Valve Manufacturing Company
INDIAN ORCHARD, MASSACHUSETTS

Choose

HORTON TANKS



realize new profits in storing corrosive materials



The 200,000-gallon Horton elevated tank at the left serves a growing chemical plant in the heart of industrial Chicago-land by storing 77.7 per cent sulphuric acid. This corrosive solution is produced largely for local steel mills to use in pickling operations.

The tank, 31½ ft. in diam. by 35 ft. high, has a self supporting umbrella roof thereby eliminating interior supporting columns. All joints are carefully welded to assure a minimum of maintenance and costly repairs even in corrosive service.

When you need dependable, more profitable storage for corrosive materials—choose Horton tanks. They can be fabricated from a variety of clad and solid corrosion-resisting metals to fit every requirement. Specialized tank construction such as this offers no obstacles to our design, fabrication, and erection departments. We have equipment for stress relieving and x-raying—and recently we have enlarged our facilities for pickling and painting by the Phosco Process.

Write our nearest office for quotations on tanks built of special metals as well as carbon steel structures. There is no obligation on your part.

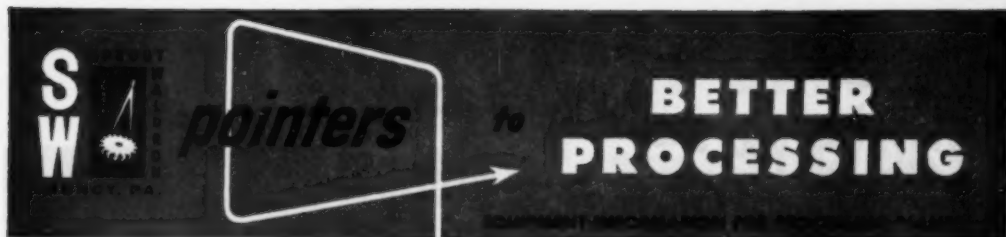
CHICAGO BRIDGE & IRON COMPANY

Atlanta 3 2120 Healey Bldg.
Birmingham 8 1510 North Fifth St.
Boston 10 1005—201 Devonshire St.
Chicago 4 2124 McCormick Bldg.
Cleveland 15 2220 Guildhall Bldg.

Detroit 26 1503 Lafayette Bldg.
Houston 2 2103 National Standard Bldg.
Los Angeles 17 1505 General Petroleum Bldg.
New York 6 3318—165 Broadway Bldg.
Philadelphia 3 1623—1700 Walnut St. Bldg.

Salt Lake City 4 505 West 17th South St.
San Francisco 4 1322—200 Bush St.
Seattle 1 1305 Henry Bldg.
Tulsa 3 1623 Hunt Bldg.
Washington 6, D. C. 1160 Catritz Bldg.

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY and GREENVILLE, PENNSYLVANIA



Streamlined Materials Handling of Bulk Chemicals

For years calcium carbide, used in acetylene and synthetics, was shipped in 1000 lb. steel drums. Loading a shipment of carbide was slow, arduous work, eating up plenty of man-hours. Depreciation on drums due to rough handling was especially high. And, loss through spillage was an evil accepted by both manufacturer and consumer.

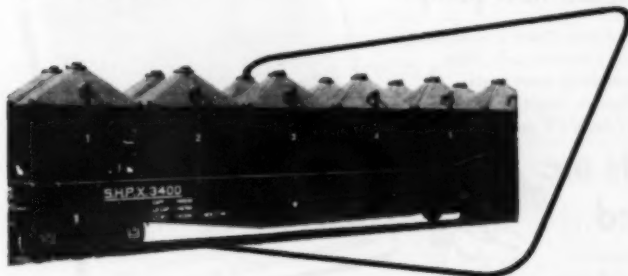
The growing demand for carbide by large industrial users necessitated a more efficient, economical method of handling carbide in bulk.



The SOLUTION: A five-ton capacity, all-steel, air-tight portable container which discharges directly to the acetylene generator. Units can be nested by the dozen on flat cars or loaded on trucks in sets of three.

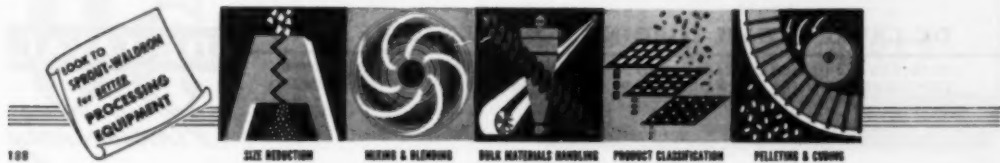
RESULT: Each container holds 10 times more carbide...is filled, sealed, and moved mechanically with lowest costs ever!

Sprout-Waldron built over 2500 of these specially designed containers. Why not take advantage of this wealth of experience? We can also help you cut corners in the moving of bulk chemicals.



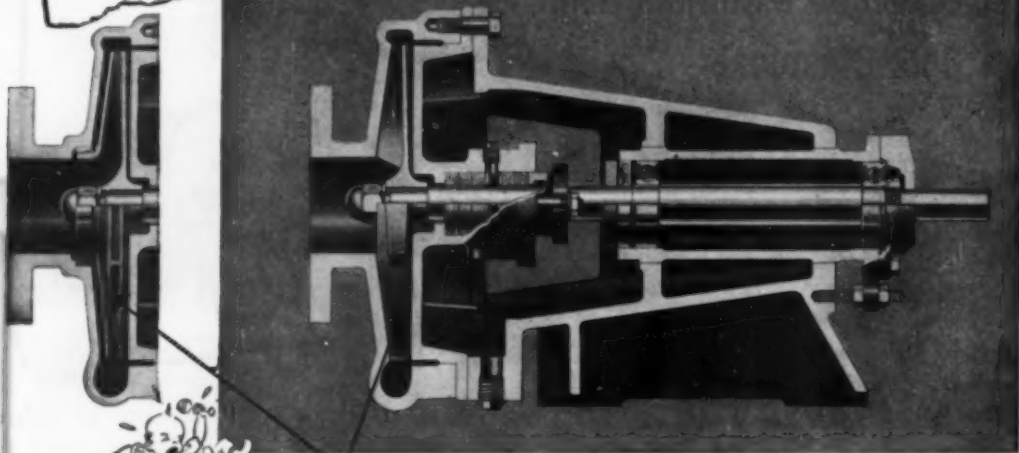
For further information about this equipment write to Sprout, Waldron & Co., Inc., 15 Waldron St., Muncy, Pa.

Sprout-Waldron
Manufacturing Engineers
SINCE 1865
MUNCY • PENNSYLVANIA



100

Facts you should know about De Laval "CP" process pumps!



**When service requirements
change, you don't have to
buy a whole new pump!**

The De Laval CP pump can be quickly converted from closed to open impeller (or vice versa) by changing the pump volute and impeller only. This standardization also means you can keep your stock of spare parts to a minimum. Three sizes of shafts, shaft lock-nuts, bearings, bearing cartridges and pedestals fit all nine sizes of De Laval CP pumps.

**Shims and fussy fits are
old fashioned...**

When you have to compensate for wear between the impeller and case, it is only necessary to face off these parts, reassemble the pump and position the impeller with the external adjusting screw provided for that purpose. No shims required—no fussy fits.



Did you also know?...

that the external adjusting screw can be used to pull the impeller off the shaft? It is quick, easy and requires no special tools.

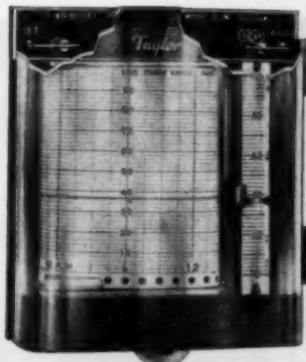
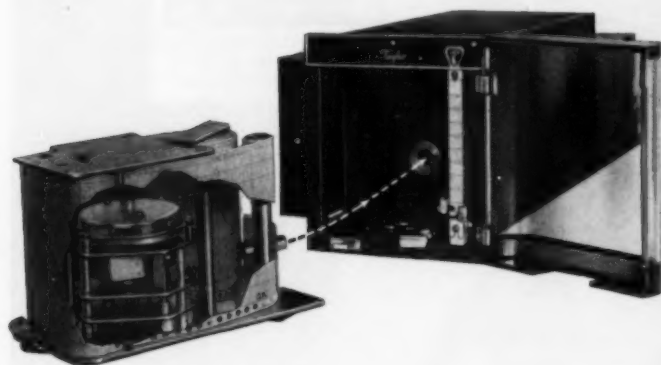
DE LAVAL STEAM TURBINE CO., TRENTON 2, N. J.

TURBINES • HELICAL GEARS • CENTRIFUGAL BLOWERS AND COMPRESSORS
CENTRIFUGAL PUMPS • WORM GEAR SPEED REDUCERS • IMO OIL PUMPS

50th
DE LAVAL
Anniversary

PNEUMATIC CHART DRIVE FOR HAZARDOUS ATMOSPHERES

on Taylor's TRANSET
Recorder*



A 3-hour continuous record is visible on this thirty-day rectilinear strip chart. This TRANSET Recorder fits 4 1/2" x 5" panel space, with automatic-manual unit, remote set point adjustment, valve position indicator—all with unmatched accuracy and dependability.

Another Taylor Hit! The air driven chart drive mechanism for the popular TRANSET RECORDER makes all the advantages of the recorder available to installations in hazardous atmospheres. No electrical connections. The air jet turbine is geared to a self-starting escapement. The pneumatic chart drive is precision-built to give performance that equals or betters spring actuated clock mechanisms.

Accurate, Trouble-free performance is assured because the escapement mechanism is sealed in a rugged, air-tight, rust-proof housing mounted above the air jet out of the air stream.

Low Air Consumption! Only .08 scfm at 20 psi. Operates accurately even though air supply fluctuates within 15 and 35 psi.

Minor timing adjustments can be made externally, and the whole unit may be removed from the chart assembly by removing just three screws.

*Trade-Mark

Self-sealing air connection shuts off air supply automatically when chart drive is removed.

For Complete Details, send for Bulletin 98097-A.

Taylor Instrument Companies, Rochester, N. Y., and Toronto, Canada.

*Instruments for indicating, recording
and controlling temperature, pressure,
humidity, flow and liquid level.*



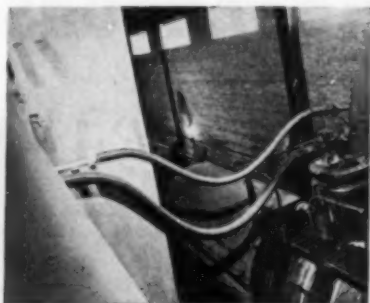
Taylor Instruments

— MEAN —

ACCURACY FIRST

IN HOME AND INDUSTRY

What's U. S. Rubber doing to aid sewage treatment?



Ferric chloride is carried by U.S. Giant Acid Hose from tank cars to large acid storage tanks. The air hose throughout the plant is U.S. Brand.

In a large midwestern sewage plant, the acid storage tanks, pipes and fittings have U.S. Rubber linings. Conveyor belts, air and acid hose likewise are of U.S. Rubber manufacture. And the filters are equipped with Uscolite plastic piping and fittings developed by "U.S." engineers. All the above mentioned products are resistant to the highly corrosive action of ferric chloride, used in sewage treatment.

This installation — involving so many different products — affords convincing evidence of the scope and versatility of U.S. Rubber engineering skill.

These large storage tanks are protected by U.S. Permabond Rubber Lining especially compounded to resist corrosive action of ferric chloride solutions. Size of the tanks made it necessary to rubber line and vulcanize them in the field. Lining runs over the tops of tanks and extends down the outside 18 inches. See arrow.



22 U.S. Rubber conveyor belts run below the floor, collecting sludge as it drops from the filters, and carrying it to the driers.

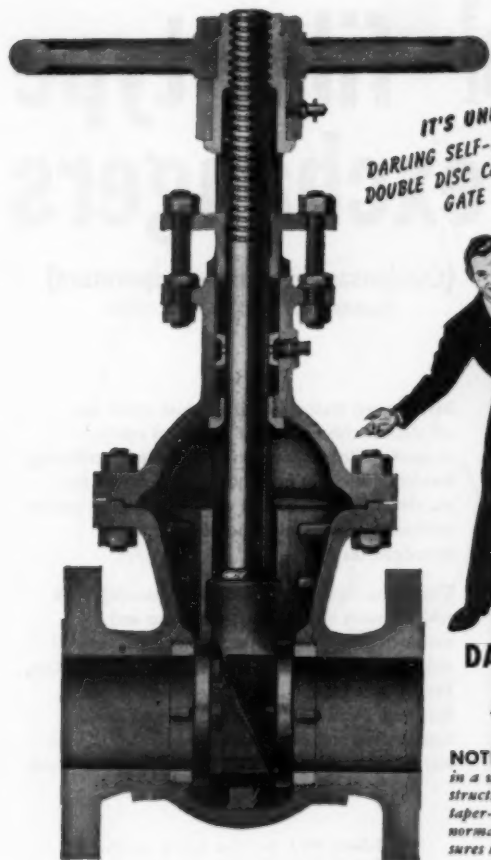
PRODUCTS OF



UNITED STATES RUBBER COMPANY

MECHANICAL GOODS DIVISION • ROCKEFELLER CENTER, NEW YORK 20, N. Y.

WHY seat misalignment doesn't cause this Darling Valve to leak!



IT'S UNIQUE
DARLING SELF-ADJUSTING,
DOUBLE DISC CAST STEEL
GATE VALVE



NO gate valve body ever made is entirely immune to distortion caused by line stresses and temperature changes. Yet even slight distortion can throw the seats out of alignment—probably the most common cause of leaky valves and costly replacement.

That's one reason why Darling gate valves, with their unique wedging principle combined with fully revolving double discs and parallel seats, have the jump on other valves. They easily, *automatically* adjust for valve body distortion, cinching tight, leak-proof closure without destructive strong-arm tactics. Most important, you avoid costly down-time and repeated maintenance headaches.

But that's not all! Actually, this Darling principle offers several other equally important time-and-money-saving advantages. In plant after plant they add up to trouble-free performance and longer service life with a very minimum of attention.

GET ALL THE FACTS

Send for descriptive cast steel valve Bulletin No. 5003.

DARLING VALVE & MANUFACTURING CO.

Williamsport 3, Pa.

Manufactured in Canada by Sandiland's Valve Manufacturing Co., Ltd.,
Galt 19, Ontario

NOTE: Darling gate valves are made in a wide range of sizes, types and constructions, including solid and slotted taper-seat wedge types, for all kinds of normal and corrosive services in pressures up to 1500 pounds.

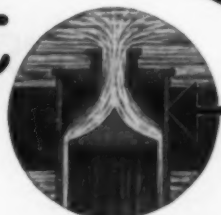
FOR PLUS VALUES, JOB-PROVED AGAIN AND AGAIN



Dirty Water can't "Shut-down..."



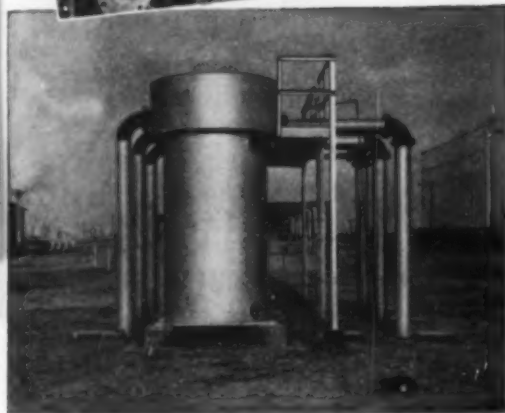
Vogt



film type exchangers

(Condensers—Coolers—Evaporators)

Patent Nos. 1,935,270 - 2,057,597 - 2,424,441



River water, well water or brackish water are all alike to this exchanger *because it can be cleaned while in operation!* The water distributing ferrules need only be removed successively for the cleaning brush or tool whereby the tubes receive additional water which sluices away the dislodged dirt.

Vogt Film Type Exchangers are operating with real economy of first cost, operation and maintenance in power, petroleum, and chemical industries. They serve as Jacket Water Coolers, Feed Water Heaters, Hydrocarbon Evaporators, Sulphuric Acid Coolers, and Sulphur Dioxide Condensers, and can be designed to cool or heat any liquid and to condense or evaporate any fluid.

TOP: Four units at Newton Falls, Ohio Municipal plant cool water for diesel engines and a lubricating oil cooler.

BOTTOM: Jacket Water Coolers serving engines of 7,300 HP in the compression plant of a Western Oil Refinery.



[Bulletin HE-7 describes typical installations of Vogt Film Type exchangers and is available upon request.]

HENRY VOGT MACHINE CO., LOUISVILLE, KY.

Branch Offices: NEW YORK, CHICAGO, CLEVELAND, DALLAS, PHILADELPHIA,
ST. LOUIS, CHARLESTON, W. VA.



We can do tricks with Wyandotte Caustic Soda

One manufacturer was buying three different grades of caustic from as many suppliers. He thought he needed them for his different soaps and different processes. Then he came to us and we found that one grade of Wyandotte Caustic filled all three of his specifications.

Another manufacturer had been buying a regular grade caustic and then purifying it. Now he's buying Wyandotte Mercury Cell Caustic — the caustic that's naturally pure — and he's eliminated the purification step entirely.

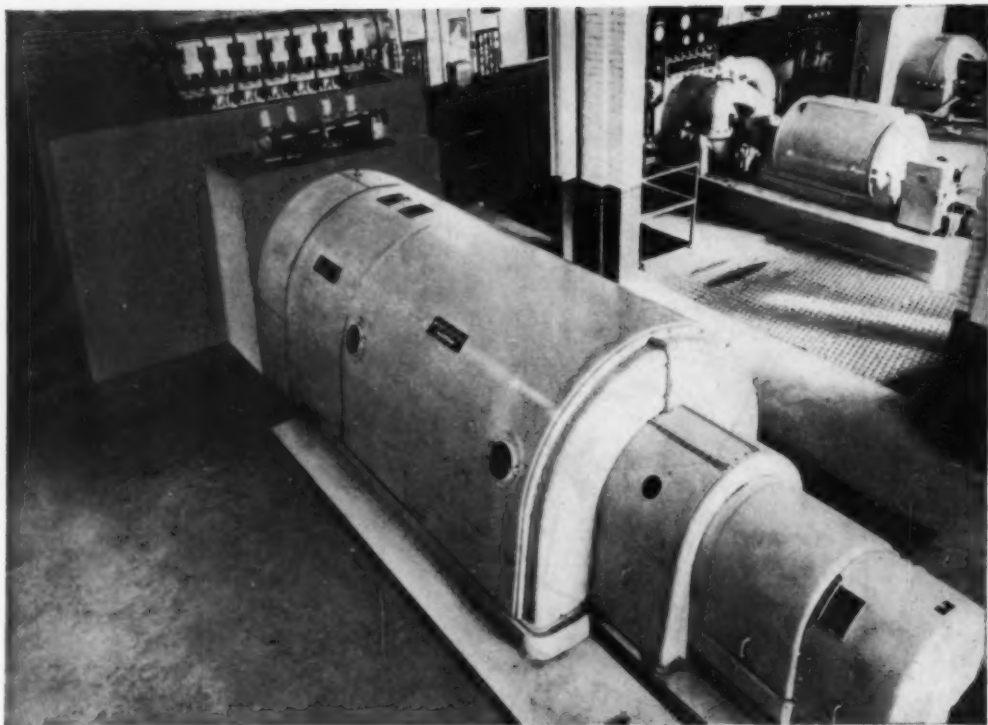
Wyandotte Caustic is versatile. It can be used for soaps or synthetics, paints or paint removers, inks or insecticides, dyes or cattle dips, textiles or lubricants — and scores of other products. When you need a good caustic, you need Wyandotte Caustic.

SODA ASH • CAUSTIC SODA • BICARBONATE OF SODA
CALCIUM CARBONATE • CALCIUM CHLORIDE • CHLORINE
HYDROGEN • DRY ICE • SYNTHETIC DETERGENTS • GLYCOLS
CARBOSE (Sodium CMC) • ETHYLENE DICHLORIDE • PROPYLENE
DICHLORIDE • AROMATIC SULFONIC ACID DERIVATIVES
OTHER ORGANIC AND INORGANIC CHEMICALS

WYANDOTTE CHEMICALS CORPORATION
Wyandotte, Michigan • Offices in Principal Cities



Wyandotte
REG. U. S. PAT. OFF.



How Rock Hill and Worthington Balanced Steam and Power

During its fast growth, Rock Hill Printing and Finishing Company, Rock Hill, South Carolina, has made extensive changes in the power plant.

Since 1929 electrical demand has greatly increased. Also, plant process has called for large quantities of steam at 90-100 psi and at 15 psi pressure.

When a new 150,000 lb-hr boiler was installed, another Worthington 5000-kw non-condensing extraction-type turbine generator was also installed. This latest Worthington unit operates on steam at 230 psi, 575 FTT, and automatically extracts steam at 100 psi, exhausting at 15 psi back pressure.

The unit has sufficient flexibility between extraction and back pressure to handle variations in flow requirements and to carry an electrical load varying from 3000 up to an anticipated 5000 kw.

By purchasing a *Worthington* unit, Rock Hill also benefits from unit responsibility for design, assembly and performance.

Worthington builds turbine-generator sets in sizes up to 10,000 kw and in all types. For detailed proof that *there's more worth in Worthington*, call our nearest office or write to Worthington Pump and Machinery Corporation, Steam Turbine Division, Wellsville, New York.

WORTHINGTON



STEAM TURBINE GENERATORS

V.17

**A GREAT
TEAM
IN
STEAM**



Single-Stage
Turbines



Multi-Stage
Turbines



Turbine-Generator
Sets



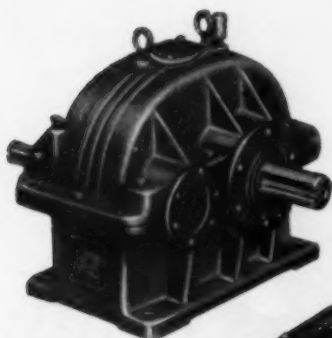
Feed Water
Heaters



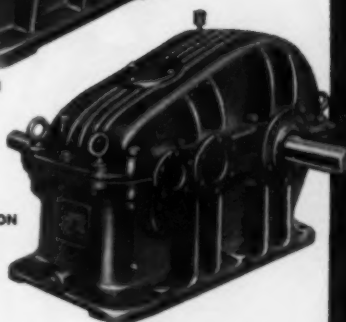
Boiler Feed
Pumps



Surface
Condensers



SINGLE REDUCTION



DOUBLE REDUCTION

COMPACT
MORE POWER
IN LESS
SPACE!



TRIPLE REDUCTION

**FOOTE BROS. MAXI-POWER
PARALLEL SHAFT
HELICAL GEAR DRIVES**

MORE POWER — LESS SPACE— Precision processed gearing, improved materials and heat-treatment, closer manufacturing tolerances, permit selection of smaller size, lower weight units.

IMPROVED PERFORMANCE— Generated helical gearing of maximum accuracy for uniform load distribution—positively located gearing for full tooth engagement across entire gear face—all mean better performance.

SMOOTH OPERATION— Overlapping tooth action of highly accurate helical gearing—close backlash tolerances—reinforced housing design plus extra capacity Antifriction Bearings Throughout provide smooth, quiet operation.

42 SIZES— Single, double and triple reductions, ratios from 2.08 up to 360 to 1—capacities up to 1,550 h.p. provide the correct unit for practically any application.

A Foote Bros. enclosed gear drive for any industrial application. Foote Bros. will gladly consult with you on your enclosed gear drive requirements.



LINE-O-POWER DRIVES



FOOTE BROS. LOUIS ALLIS
GEARMOTORS



HYGRADE DRIVES

FOOTE BROS.

Better Power Transmission Through Better Gears

WRITE FOR BULLETIN MPB

FOOTE BROS. GEAR AND MACHINE
CORPORATION
Dept. CE, 4545 So. Western Blvd., Chicago 9, Ill.
Send me Bulletin MPB on Foote Bros.
Maxi-Power Drives.



Name.....
Company.....
Position.....
Company Address.....
City..... Zone..... State.....

There's only one
TAPER-LOCK

Precision-Grooved

True Running

Easy on—Easy off



TAPER-LOCK bushing grips the shaft for the full length of the bushing — holds sheave with firmness of a shrunk-on fit. No wobble. Taper-Lock runs true!

No flange—no collar—no protruding parts. Flush machine-tool appearance.

Finest grade of close-grained semi-steel, cast in the Dodge foundry.

The grooves, machined on precision equipment, have identical pitch diameters.

This insures equal belt tension. Every belt pulls its share of the load!

TAPER-LOCK sheaves are available from distributors' stocks in complete range of sizes in A, B, C and D grooves.

DODGE SEALED-LIFE BELTS have special protection for tension members, insuring longer belt life. Perfectly matched to **TAPER-LOCK** sheaves.

DODGE MANUFACTURING CORPORATION, 200 Union Street, Mishawaka, Ind.

DODGE

of Mishawaka, Ind.



CALL THE TRANSMISSIONER, your local Dodge Distributor. Factory trained by Dodge, he can give you valuable assistance on new, cost-saving methods. Look for his name under "Power Transmission Equipment" in your classified phone book.

FIRST
IN POWER TRANSMISSION
MACHINERY!



V-BELTS AND TAPER-LOCK SHEAVES



DODGE-TINKER PILLOW BLOCKS



ROLLING GRIP AND DIAMOND D CLUTCHES



SOLID STEEL CONVEYER PULLEYS

NAME PLATES

FOR YOUR NAME PLATE REQUIREMENTS, WRITE OUR SUBSIDIARY,
CHICAGO THRIFT-ETCHING CORPORATION, 1535 SHEFFIELD AVENUE, CHICAGO, ILLINOIS



Instrument NEWS

B. F. Goodrich Adds G-E Mass Spectrometer To New Research Facilities

B. F. Goodrich scientists say their General Electric mass spectrometer will get solutions to new problems plus new approaches to old problems. The creation of new products will be speeded by the G-E instrument, they say. The G-E spectrometer was purchased in line with the B. F. Goodrich policy of using the latest scientific equipment.



With automatic operation and immediate high-speed pen recording, results are obtained at once. A wide range permits work on most chemical compounds. General Electric offers complete advisory service to present and prospective users, including analysis of compounds.

G-E Dewpoint Recorder...



... used for checking moisture content of charged cylinders of nitrogen, oxygen, etc., in plant of the National Cylinder Gas Co., in Chicago, Ill.

Electron Diffraction Instrument Speeds Surface Analysis



An operator in an industrial laboratory, studying surface phenomena, removes plate holder from camera.

Analysis of thin fibers and surface coatings are greatly facilitated with the G-E electron diffraction instrument, especially in cases where X-ray diffraction techniques fail because of too-deep penetration.

The instrument is proving to be a valuable tool wherever a knowledge of the chemistry of solid surfaces is required. It is being used to study all types of surface phenomena and is applied to research, development, and control work.



Articles to be tested are inserted in this specimen chamber, shown with door open.

Ten Photoelectric Recorders Used at Battelle Institute

Battelle Institute, Columbus, Ohio, is now using ten General Electric photoelectric recorders in its industrial-research laboratory.

Some of the recent applications for which photoelectric recorders have been used at Battelle are: differential thermal analysis, and recording short-time high-temperature creep qualities of various metallic and plastic substances. It is also used as a sensitive recording instrument for use in measurement and non-destructive testing where it responds to, and signals from devices such as: ionization gages, photoelectric cells, thermocouples, transducers, and strain gages.

The Type CE photoelectric recorder measures d-c volts or amperes directly,

and will record almost any quantity that can produce a d-c signal which varies in proportion to the quantity being measured. Chart speeds range from $\frac{1}{2}$ inch per hour to 72 inches per minute; sensitivities are as high as 1.0 microampere full scale; response periods as fast as $\frac{1}{2}$ second for full-scale deflection.

SECTION E 687-73 GENERAL ELECTRIC COMPANY, SCHENECTADY, N. Y.

Please send me the following bulletins:

- | | |
|---|---|
| <input type="checkbox"/> GEC-656 Electron Diffraction Instrument | <input type="checkbox"/> GEC-587 mass spectrometer |
| <input type="checkbox"/> GEC-696 mass spectrometer tubes and components | <input type="checkbox"/> GEC-588 dewpoint equipment |
| | <input type="checkbox"/> GEC-254 Type CE photoelectric recorder |

NAME _____ (PLEASE PRINT)

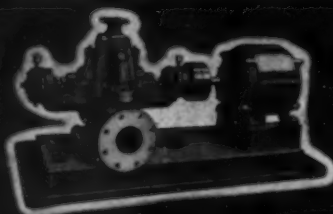
COMPANY _____

STREET _____

CITY _____ ZONE _____ STATE _____

GENERAL  ELECTRIC

Warren-Quimby
Gear-in head Screw Pump



Warren Condensate Pump

Warren Horizontal Duplex
Hydraulic Pump



WARREN PUMPS

Maintain efficiency • Operate at low cost • Are long-lived



Warren Type "L" Single-Stage
Single-Suction Liquor Pump

CENTRIFUGAL

Single and Multi-stage
Pressure range: Up to 1300 P. S. I.
Capacities: Up to 50,000 G. P. M.
Types: Horizontal and Vertical
Impellers: Open or Enclosed

RECIPROCATING

Horizontal and Vertical Single Piston
Horizontal and Vertical Duplex Piston
Single and Duplex Outside Packed Plunger
Single, Duplex and Compound Hydraulic
Steam Heat Vacuum
Automatic Pump and Receiver, etc., etc.,

WARREN-QUIMBY SCREW PUMPS

Gear-in-head and External Gear and Bearing
Capacities: Up to 3000 G. P. M.
Pressures: Up to 200 P. S. I. on low viscosity
liquids; practically unlimited on
high viscosity liquids
Horizontal or Vertical Mounting

WARREN-QUIMBY ROTARY PUMPS

Gear-in-head and External Gear and Bearing
Capacities: Up to 1000 G. P. M.
Pressures: Up to 250 P. S. I.
Horizontal or Vertical Mounted

Send your pumping problem to us; Warren Engineers will recommend the right pump for the job.



Warren-Quimby External Gear
and Bearing Rotex Pump



Warren Type DBL, Single-Stage
Double Section, Centrifugal Pump



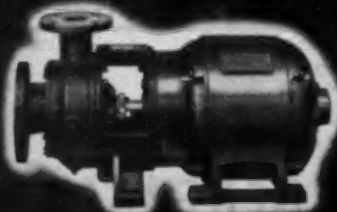
Warren Two-Stage Volute
Centrifugal Pump



WARREN STEAM PUMP COMPANY, INC.

WARREN, MASSACHUSETTS

Warren 4- and 6-Stage
Centrifugal Pumps



Warren "Compacunit"—4 Types—42 Sizes

Warren Horizontal "Realwear"
Duplex Piston Pump





SHORTAGE!

Growth causes shortage. The nation is growing out of its industrial breeches. Look at just this one limb of our industrial body: a quarter pound of soda ash is consumed in the manufacture of each pound of aluminum; more than a pound and a half for each pound of sodium bichromate, used in tanning and making chromic acid. When our nation calls suddenly for more aluminum, more leather and more chromium, it calls three times for more soda ash. New soda ash facilities for **DIAMOND ALKALI**, take as long to construct as any other large plant—hence the lag between demand and supply.

So much is said about war as the cause of shortage that an encouraging aspect is underplayed. Much of our present growth is permanent, to maintain abundance for our growing population. After every period of forced military growth, our civilian nation fills its new shoes with a higher standard of living. And, we become more capable of removing the causes of war—more capable of raising living standards among neighboring countries.



Chemicals you live by... **DIAMOND ALKALI COMPANY** CLEVELAND, OHIO

SODA ASH • CAUSTIC SODA • CHLORINE & DERIVATIVES • BICARBONATE OF SODA • SILICATES • CALCIUM COMPOUNDS • CHROME COMPOUNDS • ALKALI SPECIALTIES



MAINTENANCE MAN ATTACHES CLIPS OF TESTING INSTRUMENT TO CALIBRATION TERMINALS

New G-E Pyrometer Equipment Quick and Easy to Inspect and Maintain

Routine inspections of the new General Electric Type HP pyrometers can be made in the most time-saving ways—as these illustrations show.

Besides making preventative maintenance easy, this equipment has many other features to provide accurate indication and temperature control of furnaces, ovens, kilns, and other industrial-heating equipment.

ACCURATE INDICATION. Calibrated accuracy is within $\frac{3}{4}$ of 1 per cent of full scale. Automatic cold-junction compensation adjusts for changes in ambient.

CLOSE TEMPERATURE CONTROL. Any change in temperature, even as small as 0.1% full scale, starts immediate control action. Normal changes in humidity, ambient, and voltage have little

or no effect on the exactness of control action.

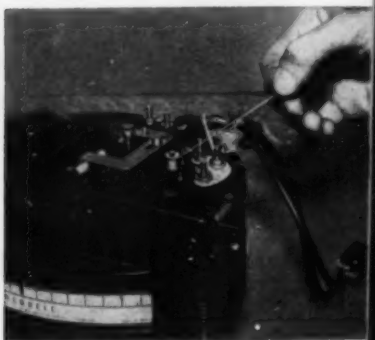
DEPENDABLE OPERATION. Strong construction throughout makes G-E pyrometer equipment exceptionally rugged. A $3\frac{1}{4}$ pound alnico magnet provides high flux density and allows large air gaps. Lightweight moving system effectively resists shocks and vibration.

FOUR TYPES AVAILABLE—indicating, protecting, two- and three-position control forms. Both flush and surface mountings can be supplied. All models are available in a variety of temperature ranges in the 0-3000 F span.

For more information, call your G-E representative or write for Bulletin GEC-713. General Electric also offers a complete line of thermocouples—described in GEC-714. Write Section 602-208, General Electric Company, Schenectady, New York.



CALIBRATION CHECKS are made quickly and without disassembling pyrometer. First, remove right-hand panel. Then attach the clips to the terminals—as shown on left.



LEAD-LENGTH RESISTANCE can be changed conveniently when pyrometer is switched to another job. Simply adjust the lead-length spool mounted on top of indicator.



PLUG-IN CONTROLLER permits easy replacement if failure occurs. Both the controller and the protector units have plugs directly attached. Just slide the unit in place.



INDICATOR EASILY CHECKED or *replaced* quickly if the need arises. The unit is connected to the terminal board by means of a plug on a short length of cord.

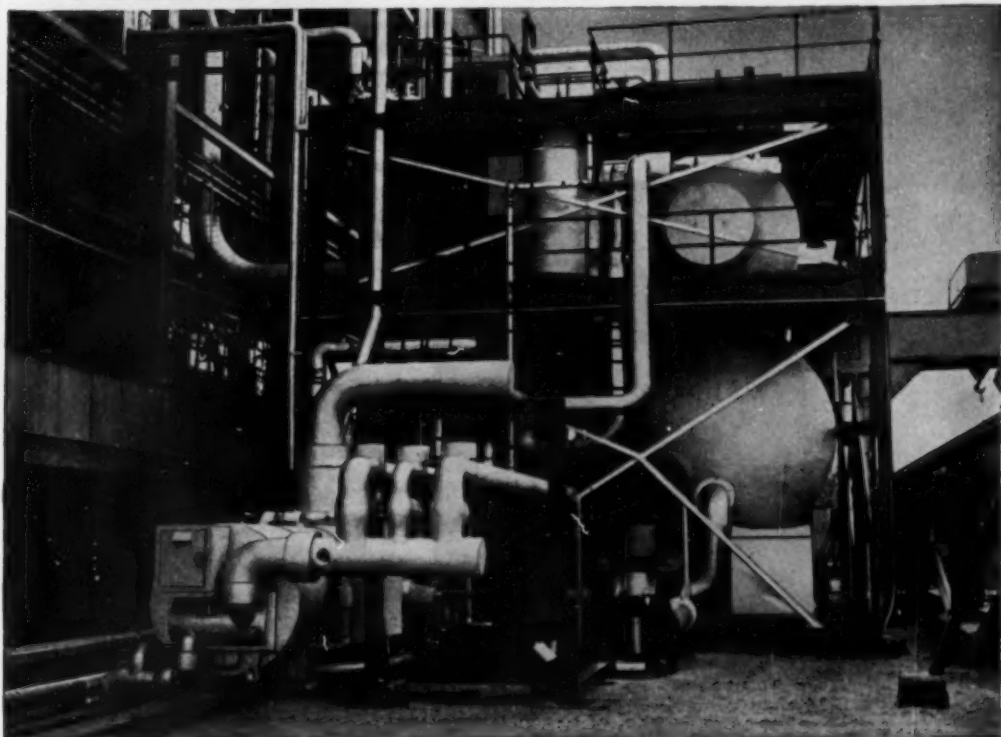
GENERAL  **ELECTRIC**

632-228



Where heat is a production tool!

—Carolina Power and Light Company
uses K&M Insulations in Lumberton Plant



Steam plant, Carolina Power and Light Co., Lumberton Station. Shown are evaporator, evaporator pre-heater, deaerating heater, and storage tank. "Featherweight" 85% Magnesia used to insulate surfaces up to 600°F.; used in combination, with

K&M Hy-Temp to insulate surfaces above 600°. Weatherproof finish. ENGINEERS AND CONSTRUCTORS: Ebasco Service, Inc., INSULATION CONTRACTORS: Guy M. Beatty Company, Charlotte, N.C.

These Keasbey & Mattison Insulations deliver more steam at less cost!

You'll find Keasbey & Mattison insulations—K&M "Featherweight" 85% Magnesia, and K&M Hy-Temp—wherever exacting steam temperature control is a must—in power stations, steamships, oil refineries, chemical plants, hospitals. These two insulations have a reputation for their cost cutting services—"Featherweight" 85% Magnesia for temperatures up to 600°F.; and in combination with K&M Hy-Temp Insulation when difficult heat control situations arise in the temperature range from 600°F. to 1900°F.

Your Keasbey & Mattison Distributor, who is

an experienced applicator, will be glad to give you complete information on any of the K&M Insulations for the 40°F. to 1900°F. service range. Or, write us.

Nature made Asbestos...

Keasbey & Mattison has made it
serve mankind since 1873



KEASBEY & MATTISON
COMPANY • AMBLER • PENNSYLVANIA

A Range of Ten Billion to One

with this CAPACITANCE TEST BRIDGE

THIS Type 1611-A Capacitance Test Bridge represents an important advance in instrumentation with its increased accuracy, improved sensitivity and extra convenience in operation over test bridges formerly available through General Radio Company.

This bridge measures capacitance from 0 to 11,000 μf with an accuracy of $\pm (1\% + 1 \mu\text{f})$ over the entire range.



This bridge is very useful for laboratory or shop tests on all kinds of paper, mica and electrolytic condensers. It is very useful for measurements of dissipation factor on bushings and insulators and electrical insulation. For measurements of dissipation factor and dielectric constant of both solid and liquid dielectric materials in chemical and plastic laboratories it provides a highly accurate, sensitive and convenient-to-use instrument.

Capacitance and Dissipation-Factor Dials direct-reading through a single window; dials approximately logarithmic

Unique Zero-Compensating Circuit requiring no "zero" corrections for accurate determinations of capacitance and dissipation factor, even at lowest bridge values

High Sensitivity . . . capacitances between 100 and 11,000 μf can be balanced to a precision of at least 0.1%

Excellent Dissipation-Factor Accuracy of $\pm (2\%$ of dial reading plus 0.05% dissipation factor) over entire range of 0 to 60% at 60 cycles

Improved Detection Circuit with single-stage amplifier and electron-ray tube as visual null indicator . . . circuit designed to be very sensitive at or near balance and insensitive off balance

Polarizing Voltage can be used through external connections up to 500 volts, d.c. One terminal grounded so that a-c operated power supply with grounded output can be used

Uniform Power Delivered to Bridge . . . four separate sources of proper impedance and voltage, each providing maximum safe power to bridge, automatically selected by multiplier ratio switch

Type 1611-A
Capacitance Test Bridge
\$440



GENERAL RADIO Company

275 Massachusetts Avenue, Cambridge 39, Massachusetts

50 West 37th St., New York 18

400 N. Michigan Ave., Chicago 11

1100 N. Second St., Los Angeles 12

their LONG LIFE *makes*
LAPP PORCELAIN RASCHIG RINGS

the most economical tower packing you can buy

THE cost of packing for chemical towers must be based on original cost of the packing against length of service, plus labor cost for cleaning and repacking, and lost production time. Because they are stronger and smoother, Lapp Porcelain Raschig Rings last longer . . . they are the most economical ceramic rings you can buy.

STRONGER, NON-POROUS PORCELAIN. Lapp Raschig Rings are made of solid Lapp Chemical Porcelain, a dense, thoroughly vitrified, pure, iron-free ceramic material of zero porosity . . . permits no absorption of liquids so avoids disintegration and crumbling.

SMOOTHER SURFACE. Without benefit of glazing, Lapp Porcelain is hard and smooth, easy to clean—and stays clean longer.

Lapp Rings are available in $\frac{3}{8}$ ", $\frac{1}{2}$ ", $\frac{5}{8}$ ", $\frac{3}{4}$ ", 1", 1 $\frac{1}{4}$ ", 1 $\frac{1}{2}$ ", 2" and 3" sizes. Write for detailed description, prices, samples. Lapp Insulator Company, Inc., Process Equipment Div., 480 Maple St., LeRoy, N. Y.

Lapp

PROCESS EQUIPMENT

CHEMICAL PORCELAIN VALVES • PIPE • RASCHIG RINGS

PULSAFEEDER CHEMICAL PROPORTIONING PUMPS

No Stuffing Box Troubles—

BECAUSE THERE ARE NO STUFFING BOXES,

in **HAGAN** RING BALANCE METERS

The design of Hagan Ring Balance Meters eliminates stuffing boxes—and hence eliminates the troubles that go with them. Adjustment is less delicate, less maintenance is required; there is one less source of friction, hence greater sensitivity; there is no danger of leakage, therefore no way in which the fluid being measured can come in contact with any critical mechanism. No leakage means also that the meter stays in calibration over a much longer period.

Absence of stuffing boxes is, however, only one of the many important features of Hagan Ring Balance Flow Meters. They are rugged, sensitive, versatile—suitable for virtually every flow-metering application, including many applications which are almost impossible with conventional meters. For full information, write to Hagan Corporation, Hagan Building, Pittsburgh 30, Pennsylvania.

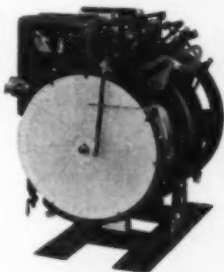
HAGAN CORPORATION

RING BALANCE FLOW AND PRESSURE INSTRUMENTS
THOUSAND FORCE MEASURING DEVICES
BOILER COMBUSTION CONTROL SYSTEMS
METALLURGICAL FURNACE CONTROL SYSTEMS

SOME TYPICAL **HAGAN** RING BALANCE METERS



Back view of single ring, high differential meter, showing S-tube connection.

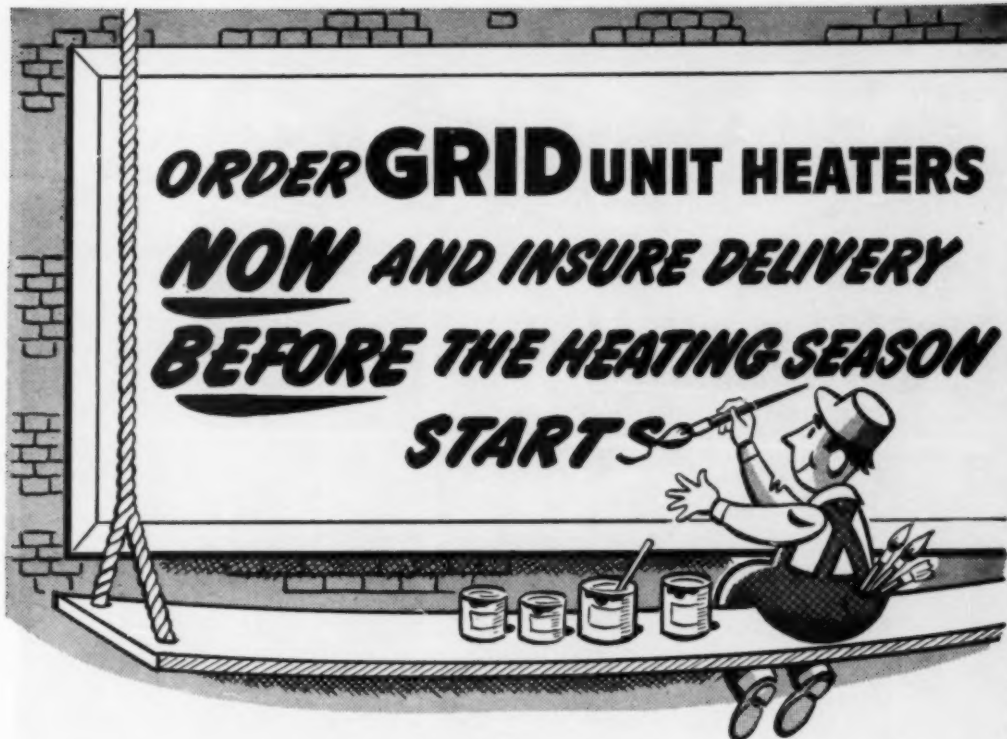


Front view of dual meter with one high differential and one low differential ring.

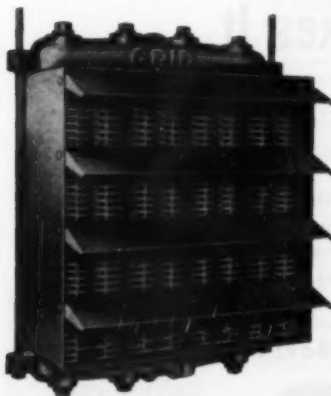


Front view of three-pen meter in case. Panel space is the same for all models.





Double your money's worth — if you order GRID Unit Heaters NOW — in advance of the regular heating season, because our inventory on GRID Unit Heaters is the best in years. And, GRID Unit Heaters are the best heating buy from the standpoint of maintenance-free service and low cost of operation. There is no waiting for delivery on GRID Unit Heaters and there is no maintenance after you get them, because . . .



THE UNIT HEATER WITH
HIGH TEST CAST IRON
HEATING SECTIONS . . .
FREE OF ELECTROLYSIS

GRID cast iron construction withstands corrosive fumes.

GRID wide fin spacing facilitates easy cleaning.

GRID will withstand steam pressures up to 250 lbs., and is free of electrolysis.

GRID fins are cast integral with the steam chamber assuring even distribution of heat. It's not possible for GRID fins to come loose from the steam chamber to cause loss of heating efficiency.

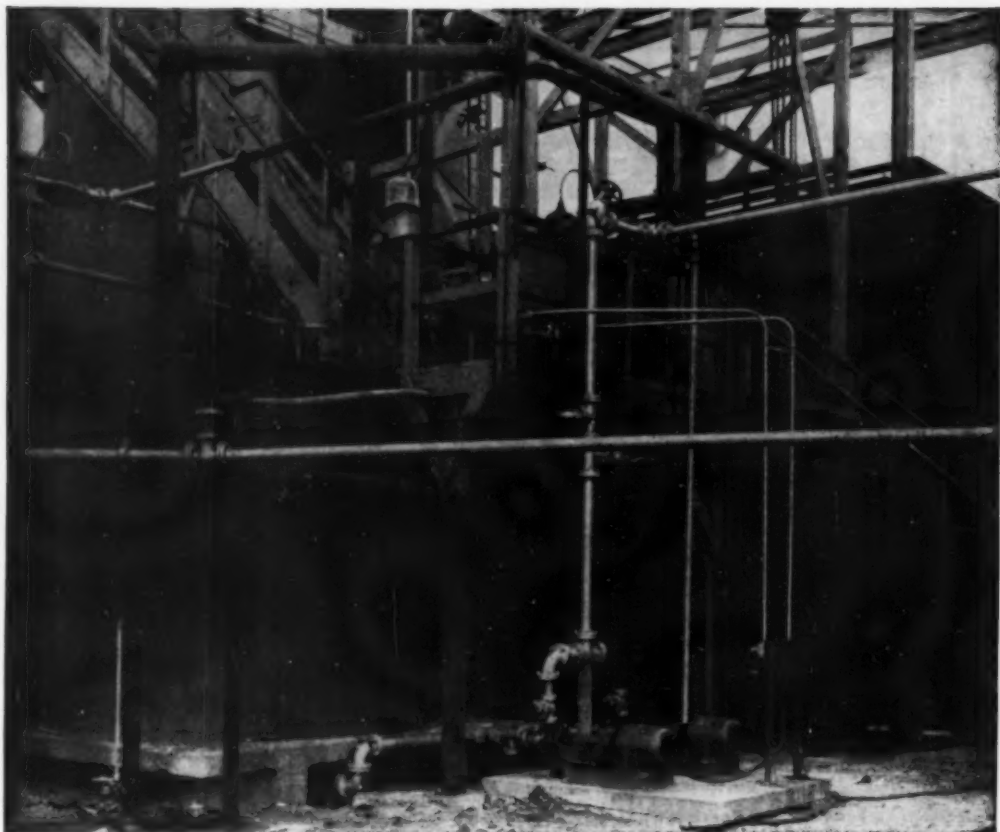
GRID design incorporating proper fan sizes, motor speeds and outlet temperatures results in a properly balanced heating unit, especially when high steam pressures are used.

Consult our Engineering Department and Sales representatives for advice on heating problems, including Unit Heaters, Blast Coils and Radiation. Send for complete catalog . . . no cost . . . no obligation.

D. J. MURRAY MANUFACTURING CO.

MANUFACTURERS SINCE 1883

WAUSAU • WISCONSIN



Ask the Man Who Makes It

It's significant that LaBour pumps are so widely preferred in the manufacture of sulfuric acid. The photograph shows a pair of LaBour DZT pumps in a contact operation. LaBour pumps of this and other types are commonly used for the manufacture and transfer of sulfuric acid.

If you are a user of sulfuric acid you can

profit by the experience of those who make it. Continuity of operation is dependent not only upon the use of proper corrosion resistant materials but upon the selection of the proper pump for the service. Today's LaBour pumps are the product of 28 years of dealing with such problems. That is why you can depend upon them.

ORIGINAL MANUFACTURERS OF THE SELF-PRIMING CENTRIFUGAL PUMP

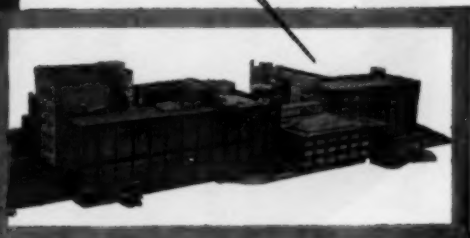
LaBOUR

THE LaBOUR COMPANY, INC. ★ Elkhart, Indiana, U.S.A.





ASHCROFT
Duragauge
SERVES BETTER
LASTS LONGER



DURAGAUGES SPECIFIED!

Ashcroft Duragauges are installed on hydrogen and city gas lines in this efficient new Lever Brothers Company plant, Los Angeles.

HERE'S WHY: Only the Ashcroft Duragauge has the *Nylon Movement*®, the movement that functions perfectly long after conventional types fail. The reason is simple: Ashcroft engineers turned from the trend toward greater bearing diameters and lengths, wider tooth engagement, harder wearing surfaces, and mass of parts *because such design increases wear*. Instead, they employed light, strong nylon to reduce wear. Thus, the Duragauge Nylon Movement has these advantages:

- | | |
|--|--|
| 1. Minimum frictional areas on mating parts | 6. Dimensional stability under high temperatures |
| 2. Unequalled resistance to wear | 7. Greatly improved indication sensitivity |
| 3. Freedom from objectional "products of wear" | 8. Sustained accuracy of indication |
| 4. High resistance to corrosion | 9. Minimum of maintenance |
| 5. Ability to absorb or soften shock impacts | 10. Longer life in "killing" services |

Men who know—engineers—recognize the Ashcroft Duragauge, with Nylon Movement, as the leader in durability and performance. That's why more and more chemical plants, refineries, and power stations are being equipped with the Duragauge.

Whatever the pressure indicating problem in your plant, see the authorized Ashcroft Distributor near you. His broad experience can be invaluable in selecting the right Duragauges for your needs.

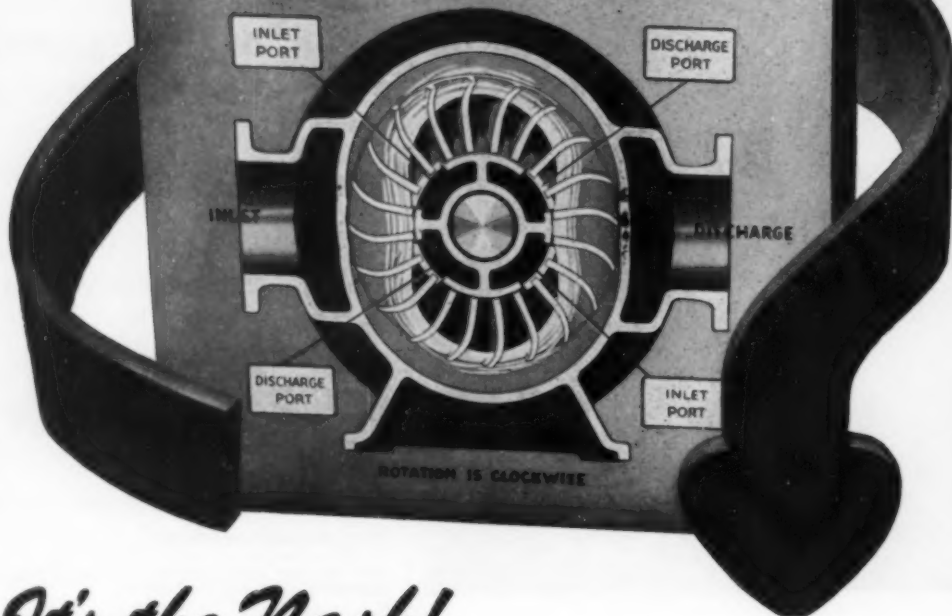
® Patented



ASHCROFT GAUGES

A product of **MANNING, MAXWELL & MOORE, INC.**, STRATFORD, CONNECTICUT
 MAKERS OF 'ASHCROFT' GAUGES, 'HANCOCK' VALVES, 'CONSOLIDATED' SAFETY AND RELIEF VALVES, 'AMERICAN' ELECTRIC AND INDUSTRIAL INSTRUMENTS. BUILDERS OF "SHAW-BOX" CRANES, 'BUGDIT' AND 'LOAD LIFTER' HOISTS AND OTHER LIFTING SPECIALTIES.

This is Why the Nash is the Most Simple Compressor



It's the Nash!

There are no mechanical complications in a Nash Compressor. A single moving element, a round rotor, with shrouded blades, forming a series of buckets, revolves freely in an elliptical casing containing any low viscosity liquid. This liquid, carried with the rotor, follows the elliptical contour of the casing.

The moving liquid therefore recedes from the rotor buckets at the wide part of the ellipse, permitting the buckets to fill with gas from the stationary Inlet Ports. As the casing narrows, the liquid is forced back into the rotor buckets, compressing the gas, and delivering it through the fixed Outlet Ports.

Nash Compressors produce 75 lbs. pressure in a single stage, with capacities to 6 million cu. ft. per day in a single structure. Since compression is secured by an entirely different principle, gas pumping problems difficult with ordinary pumps are often handled easily in a Nash.

Nash simplicity means low maintenance cost, with original pump performance constant over long periods. Data on these pumps sent immediately on request

- No internal wearing parts.
- No valves, pistons, or vanes.
- No internal lubrication.
- Low maintenance cost.
- Saves floor space.
- Desired delivery temperature automatically maintained.
- Slugs of liquid entering pump will do no harm.
- 75 pounds in a single stage.

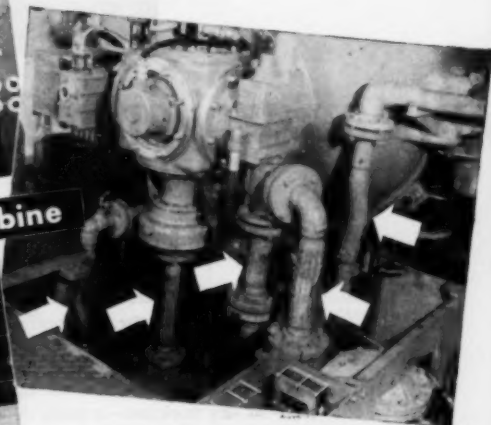
NASH ENGINEERING COMPANY
313 WILSON, SO. NORWALK, CONN.

Let CMH FLEXIBLE METAL HOSE

take the motion . . .



on a plastics press



on a gas turbine



on a separator

**and your equipment
will last longer!**

In all types of connections subject to vibration, misalignment, flexation or expansion and contraction, CMH Flexible Metal Hose will solve the problem economically and dependably . . . and in most cases, it will simplify piping hook-ups and make them easier to assemble and disassemble. Your equipment will last longer, too, if CMH Flexible Metal Hose is used to absorb the damaging effects of motion in rigid assemblies or to relieve the stresses of misalignment.

There is a CMH hose type or standard assembly to meet virtually every need. CMH distributors, located in principal cities, will be pleased to give you full information . . . see your classified telephone directory or write for literature.



REX-WELD corrugated steel and bronze hose is available in standard sizes from 1/4" through 12" I.D. for burst pressures to 12,000 psi, temperatures to 1000° F. Stainless steel types also available.



REX-TUBE convoluted hose is available in a variety of types including square locked, ball bearing and fully interlocked in a variety of metals including steel, bronze and other alloys.

Flexen identifies CMH products that have served industry for over 49 years.



CHICAGO METAL HOSE Corporation

1317 S. Third Ave. • Maywood, Ill. • Plants at Maywood, Elgin, Rock Falls, and Savanna, Ill.
In Canada: Canadian Metal Hose Co., Ltd., Brampton, Ont.

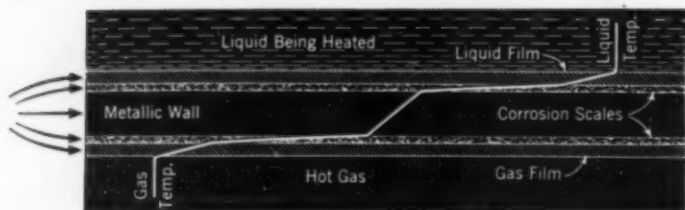
CMH

ONE DEPENDABLE SOURCE
for every flexible metal hose requirement

Convoluted and Corrugated Flexible Metal Hose in a Variety of Metals • Expansion Joints for Piping Systems • Stainless Steel and Brass Bellows • Flexible Metal Conduits and Armor • Assembly of These Components

Can you figure all

the walls



in heat exchange?

Add two unknowns to the heat transfer rate of a metal—and what do you get?

You get the problem that faces a designer trying to calculate the true performance of a proposed heat exchanger.

The rate of heat movement through a metal itself—of any thickness—is easily determined. But the effect of the gas or liquid films that will adjoin the metal wall is difficult to predict. And even more uncertain and more damaging, is the scale or oxide layer that forms on the metal surfaces.

The nature of the scale layer—its thickness, density, and chemical composition, is governed by conditions that vary in each case. But the insulating, or interfering, nature of the scale layer is tremendous.

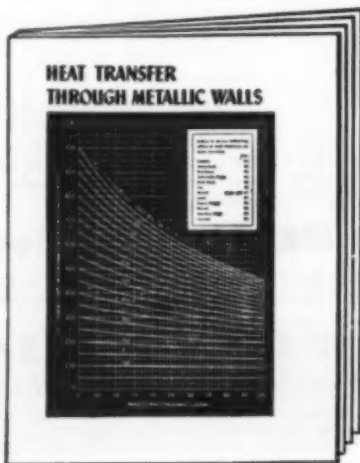
Engineers are fast learning to hold scaling difficulties to a minimum—through the selection of metal. Nickel and high-Nickel alloys are among the preferred metals because of their resistance to scale formation.

Nickel forms a very thin, tough, oxide layer for self-protection. This layer is so thin it is often invisible. But, this thin layer prevents a buildup of more oxide, protects the metal against corrosive attack that would form other coatings.

The mechanical properties of Nickel alloys give high resistance to erosion or pitting from gas, steam, or liquid. Its strength and toughness also permit thinner walls, resulting in faster heat transfer.

INCO has issued a booklet—HEAT TRANSFER THROUGH METALLIC WALLS—that contains invaluable information on heat exchange performance of many metals. A copy of this bulletin will be sent free on request.

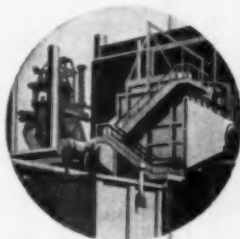
And if you have a specific heat transfer problem—the solution may be one of the INCO Nickel alloys. Right now, of course, much of Inco's production is being diverted to defense. But INCO's Corrosion Engineers are eager to aid in overcoming corrosion obstacles, both for defense operations now, and for future projects. Write us about your problem, giving full information.



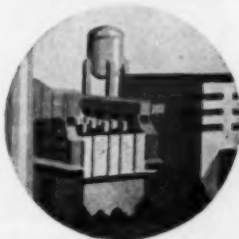
The International Nickel Company, Inc.
67 Wall Street, New York 5, N. Y.

War on waste!

American industry is continually searching for new ways to stop waste and increase production and efficiency. A good example of this is the Koppers-Elex electrostatic precipitator. Shown below are a few typical ways industry uses them to combat waste . . .



BLAST FURNACE GAS must be cleaned before it can be used as a fuel. Koppers-Elex electrostatic precipitators clean this gas to residuals as low as .002 grain per cubic foot.



FLUE GASES from recovery boilers in pulp mills contain valuable materials. Koppers-Elex electrostatic precipitators recover several hundred thousand dollars worth of these materials yearly.



FLY ASH from power plants and factories may drop a blanket of dust extending three to five miles. Koppers-Elex electrostatic precipitators stop this nuisance and preserve public good will.

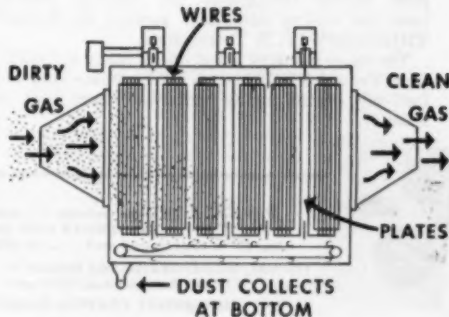
Guaranteed: All Koppers-Elex electrostatic precipitators are guaranteed to equal or better (under tests made by your own personnel) any efficiency or residual content you specify.

ENGINEERS! You should know about these six design features of Koppers-Elex electrostatic precipitators!

KOPPERS has made sweeping improvements in electrostatic precipitator design! For example, double chambers eliminate expensive by-pass systems and the resultant loss of materials during inspection or maintenance. And re-entrainment is sharply reduced because rapping is sectionalized.

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If you have a gas-cleaning problem, write today to: Koppers Company, Inc., Precipitator Dept., 218 Scott St., Baltimore 3, Md.



Koppers-Elex ELECTROSTATIC PRECIPITATORS

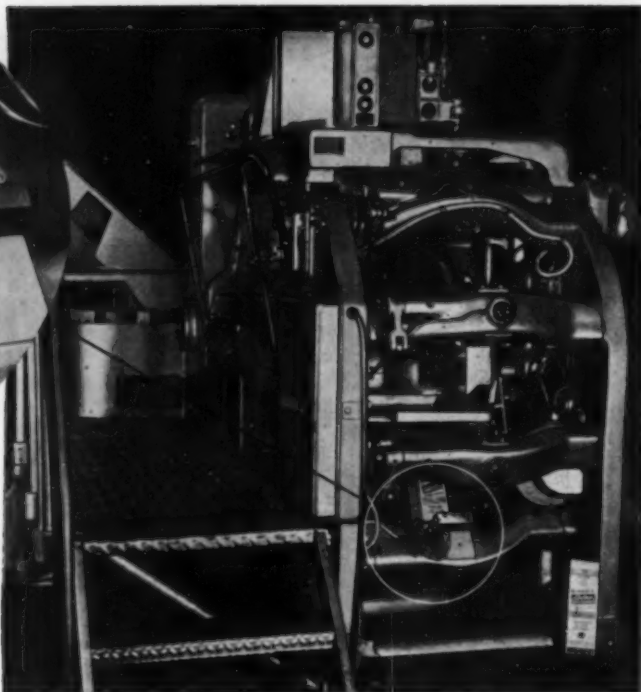


Multi-Purpose Thermostat assures uniform sealing of milk cartons

When famous Pure-Pak milk cartons were designed, a basic step in their formation was the proper sealing of the bottom flaps. The sealing was done by contact with an electrically heated block and this block had to be kept at a uniform sealing temperature.

The problem was solved when Pure-Pak, a division of the Ex-Cell-O Corporation in Detroit, installed low cost Fenwal THERMOSWITCH thermostats as the temperature control units. These thermostats provide positive control, minimum maintenance, are sufficiently compact to fit efficiently on the Pure-Pak carton-forming machine. Now dairies throughout the country benefit from the sealing uniformity assured by Fenwal THERMOSWITCH Thermostats.

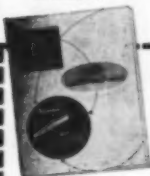
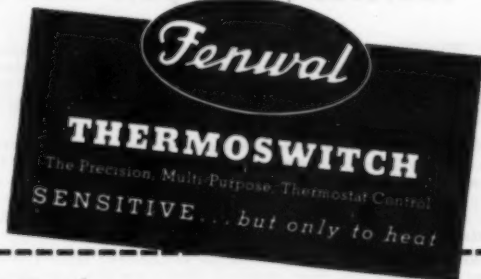
The dairy industry is but one of many to benefit from Fenwal THERMOSWITCH units. They effectively control many variables where heat is a factor.



Their unique principle of operation consists of a single-metal activating shell. This shell expands or contracts *instantaneously* with temperature changes, making or breaking the totally enclosed electrical contacts.

Fenwal THERMOSWITCH Thermostats can no doubt help you in your own processing. Find out how by mailing the coupon today.

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Fig. 2433 S. S.—Large size Stainless Steel flanged end Swing Check Valve for 150-pound W. P. Bolted cap with body-cap bolts and nuts in Stainless Steel. All dimensions conform to latest standards. Available in various other corrosion-resisting metals and alloys. Also made with screwed ends.

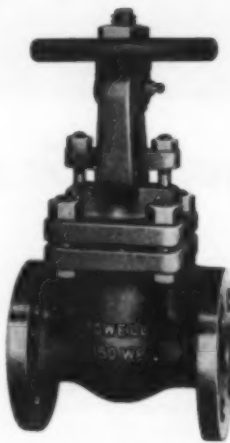


Fig. 2491—Flanged End Stainless Steel O. S. & Y. Gate Valve for 150 pounds W. P. Supplied with precision fitted, quickly interchangeable, solid or split wedges. Stem is threaded and guided through a revolving bushing. Body-bonnet bolts and nuts and packing gland eye-bolts and nuts are Stainless Steel. Compression lubricant fitting in upper yoke. All dimensions conform to latest standards. Available in various other corrosion-resisting metals and alloys. Also made with screwed ends.

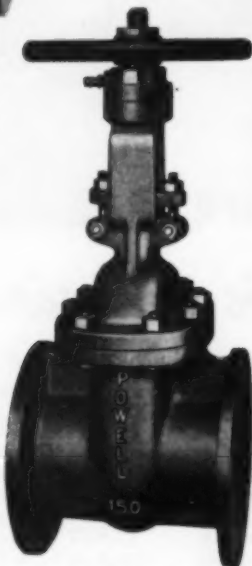


Fig. 2453-G—Flanged End Stainless Steel O. S. & Y. Gate Valve for 150 pounds W. P. Interchangeable solid or split wedges are precision fitted and accurately guided throughout entire travel. Body-bonnet bolts and nuts and packing gland eye-bolts and nuts are Stainless Steel. Compression lubricant fitting in upper yoke for lubricating stem threads and bushings. Sizes 2 1/2" to 4", incl. Sizes 5" to 30", incl. have separable yoke-arms. All dimensions conform to latest standards. Available in various other corrosion-resisting metals and alloys. Also made with screwed ends.



Fig. 2107—Flanged end O. S. & Y. 'Y' Valve for 150 pounds W. P. Can be furnished in various corrosion-resisting metals and alloys, with bolts and nuts in stainless steel. Flange dimensions and wall sections conform to ASA B-16 Standard. Sizes 1/2" to 2", incl. Screwed-end valves also available.



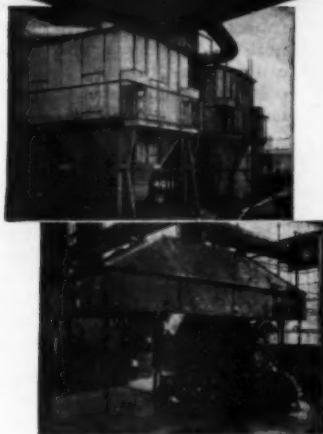
Fig. 1861—200-pound Stainless Steel Globe Valve with screwed ends, union bonnet and inside screw stem. In 2 1/2" and 3" sizes these valves have bolted bonnets. Also made in various other corrosion-resisting metals and alloys.

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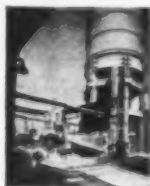
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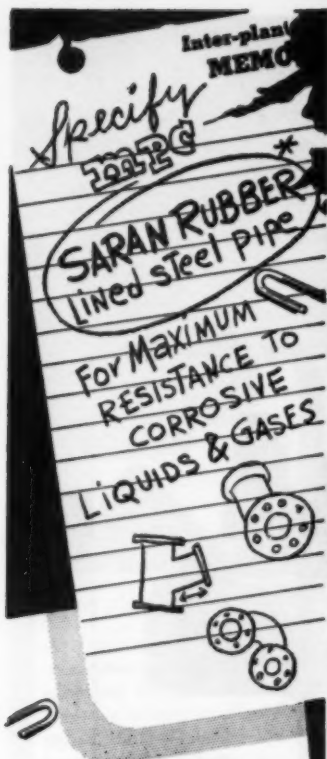
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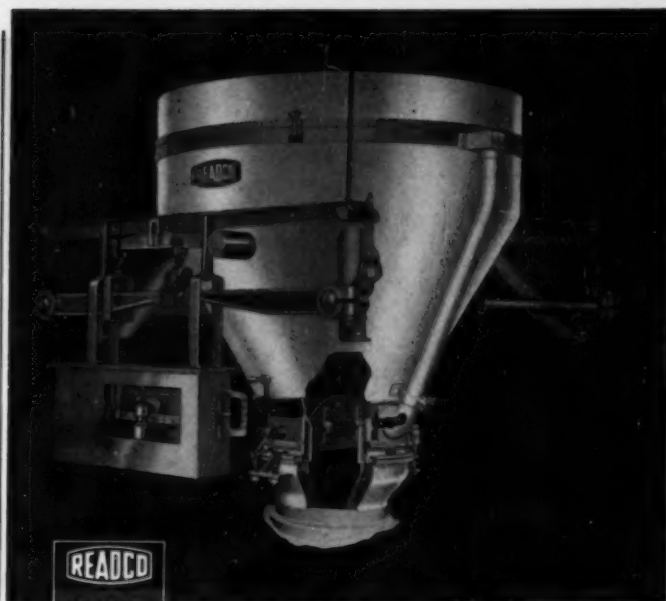
These developments are abstracted from recent publications or U. S. patents. They may suggest other applications of Jefferson Diethylene Glycol in your products or processes.



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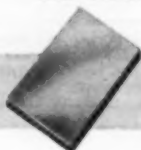
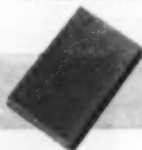
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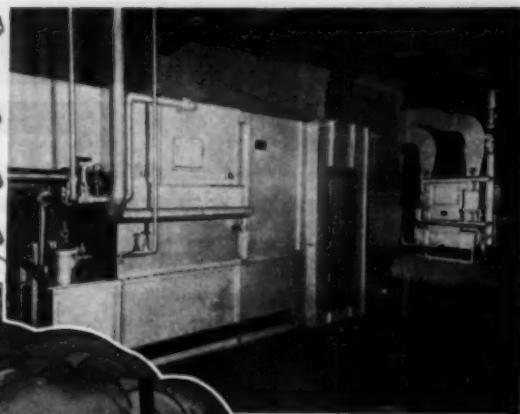
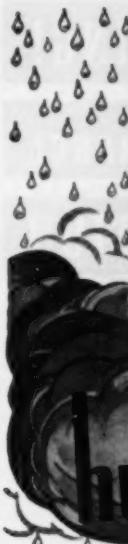
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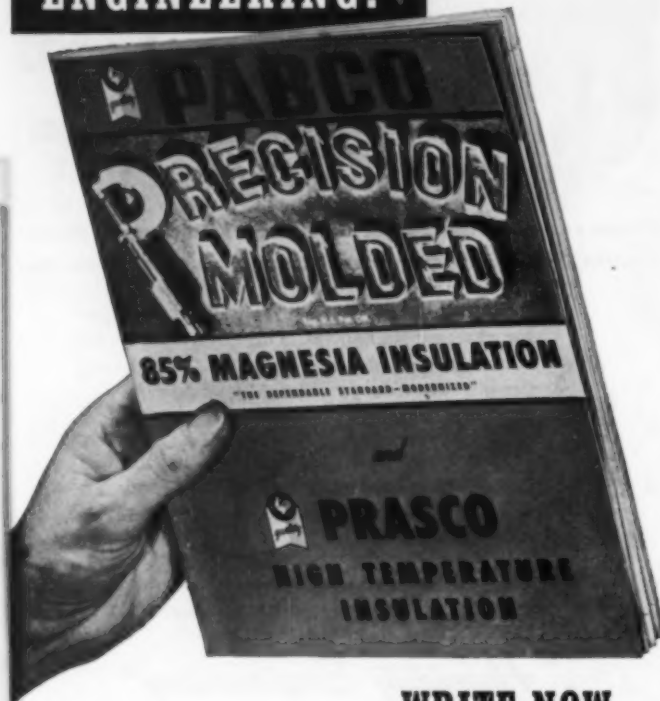


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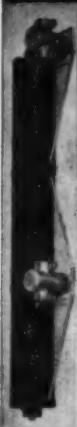
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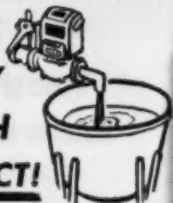
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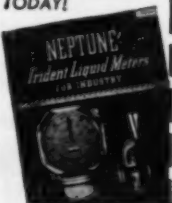


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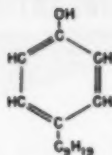
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Write for Bulletin No. 2 B-Pyroflex Construction

Maurice A. Knight

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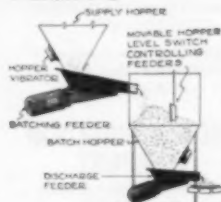
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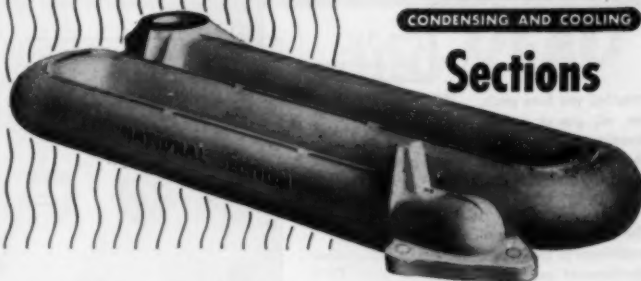
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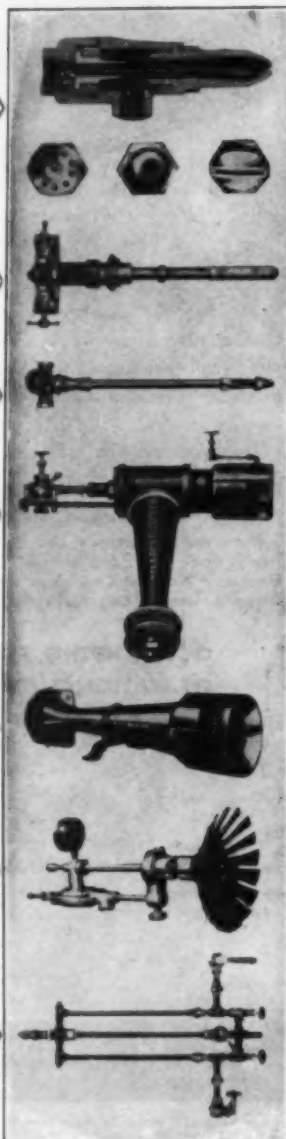
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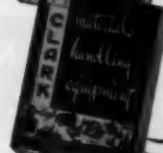
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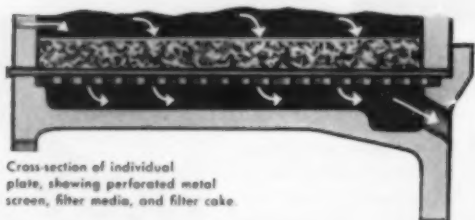
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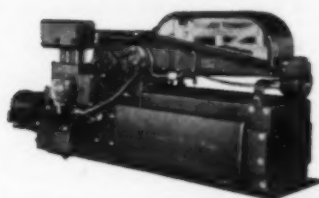
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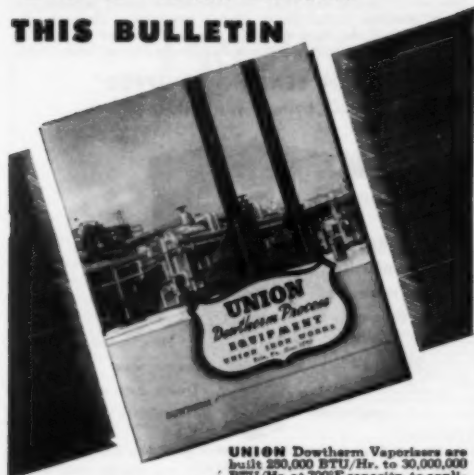
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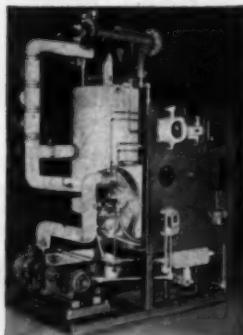
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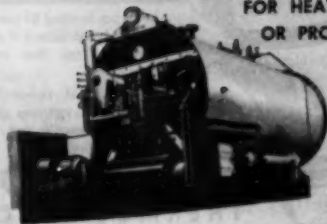
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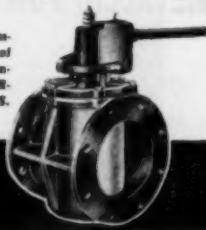
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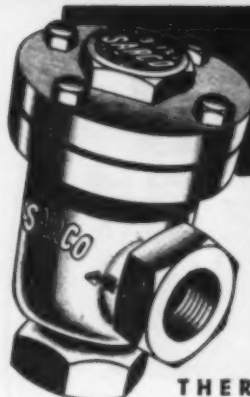
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- 1—Baker Perkins 300 gal. Unidirectional Mixer, Size 18, S.S. clad.
- 2—1000 gal. steel, jacketed, agitated, closed Kettles 80# pressure.
- 3—Baker Perkins 100 gal. Type JNM Double Arm Jacketed Mixers.
- 1—Pfaudler 1000 gal. glass-lined, jacketed agitated Kettle.
- 2—6' dia. x 30' high S.S. Bubble Cap Columns.
- 6—2000 gal. steel, jacketed, agitated Kettles, 200# pressure.
- 1—Link Belt 27" x 8' Roto-Louvre Dryer, monel.
- 2—Bufflovak 32" x 100" Atmospheric Double Drum Dryers complete with drives, motors and accessories.
- 1—Single Drum Atmospheric 5' x 6' S.S. Dryer.
- 1—16000 gal. Vert. Steel Tank 10'6" x 25' x 1/4".
- 1—16900 gal. Hor. Steel Tank 9'6" x 32' x 9/32".

MIXERS—ALL TYPES

- 3—Baker-Perkins 20, 9-gal., steam jacketed, Double Arm.
- 1—Baker-Perkins 2 gal. S.S. Double Arm.
- 1—Howes 2000# Horiz. Powder Mixer.
- 10—Day, Robinson 100# to 2000# Powder.
- 25—Electric Portable Agitators 1/4 HP to 5 HP.
- 3—Ross, Porter 40 and 50 gal. Pony Mixers.
- 9—Day Wall Mixers, 150 gal.

ROTARY VACUUM FILTERS

- 2—Oliver 8"x10' monel Rotary Vacuum Filters with monel valves, rubber-covered trough, agitator & repulper, complete with receivers, drives & motors.
- 4—Elmc 3'x1' Rotary Vacuum Filters 316 S.S. construction, complete with agitator and repulper, drives and motors.

FULL DETAILS ON REQUEST

WIRE—PHONE—WRITE

ROTARY KILNS AND DRYERS

- 1—Link Belt 27"x8' monel Roto-Louvre Dryer with steam coil heating unit.
- 2—Valco 8'x15' Kilns, 1/4" shell.
- 1—Traylor 34"x40' Rotary Dryer.
- 2—Rotary Dryers 8'x67', 6'x60'.
- 4—8'x80', 7'x60' Rotary Kilns.
- 1—Ruggles Coles Style X810 Rotary Dryer 70'x45'.
- 1—Ruggles-Coles 4'x20' Indirect Heat Rotary Dryer.
- 4—Louisville Rotary Steam Tube Dryers 8'x50', 6'x35', 30'x20'.
- 1—Adt. 5'x25' Rotary Steam Tube Dryer.

DRYERS

VACUUM AND ATMOSPHERIC

- 4—Stokes 4' Buffalo Rotary Vac. Dryers 18"x42", 30"x8", 3'x15', 3'x30'.
- 1—Stokes Vacuum Shelf Dryer, 6 shelves, 42"x48".
- 1—P&S Conveyor Dryer, 8' wide x 32' long.
- 5—Atmospheric Double Drum Dryers, 42"x120", 32"x100", 32"x80", 36"x84".
- 1—Single Drum Atmospheric 5'x7'.
- 2—Devine 5'x12' Vacuum Drum.

MISCELLANEOUS

- 7—Stokes Vacuum Pumps, 15 to 100 CFM.
- 1—Milton Roy Proportioner Pump, S.S. and Hastelloy, 10 gpm.
- 1—Oliver Vacuum Pump, 400 cfm.
- 1—Stokes Combination Condenser & Receiver, 137 sq. ft.
- 1—Colton Tablet Machine 25½.
- 2—Stokes Rotary Tablet Machines DD64, DD63.
- 1—21 Anderson Expeller.
- 2—Nash Hytor Vacuum Pumps to 400 cfm.
- 1—Mits & Merrill 210 Paper Shredder.
- 1—Knapp 2429 Automatic Carton Sealer.
- 10—Olivette Durizon & Rubber Centrifugal Pumps, 1½ to 4".

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- 1 Sprout Waldron Attrition Mills, double disc—size 18 and 30.
- 1 Williams Hammer Mill, type AE, size A, stainless steel.
- 1 Mikro Pulverizers—2251, 217.
- 1 Fitzpatrick Comminuting Machines—Stainless, model D.

4 INDUSTRIAL FILTER & PUMP MFG.
CO. Pressure leaf filters, type RB-2, size 18 x 48, approx. 68 sq. ft.; rubber lined tank, bronze baffles. With slurry tank, pump & motor.

- 2 Sweetland Filters—22 and 23.
- 1 Swenson Rotary Continuous Vacuum Filter; Precut type, 8' dia. x 8' face, rubber covered and lead acid proof construction.
- 10 Filter Presses, 12" to 36", C. L. P&F.
- 2 Louisville 8-roll Continuous Grains Presses, 24" and 36".
- 2 Davenport Rotary Grains Presses 2A, 3A.
- 1 Vacuum Pan Dryer or crystallizing Kettle, 18" dia. x 3' deep.
- 2 Pan Dryers or crystallizing Kettles, 18" dia. x 3' deep and 3' dia. x 30" deep.
- 1 Stokes 238A Vacuum Rotary Dryer, 18" dia. x 48" long, with pump and condenser.
- 2 Alm. Double Drum Dryers, 22" x 36".
- 1 Alm. Tray Dryer, 1080 sq. ft.
- 1 Cummer Rotary Indirect Hot Air Dryer, 4' dia. x 38" long, complete.

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TANKS, PUMPS, ETC.**
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- 1 Porter heavy duty jacketed double worm mixer—75 gal.
- 2 Reed heavy duty double arm jacketed mixers, 200 gal. working cap.—1 stainless lined.
- 2 Reed jacketed Ribbon Mixers, 80 gal.
- 1 Broughton Powder Mixer, double arm, 2400 sq.
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- 1 Rotex Screen, size 21, single deck.
- 2 Kux Mch. Co. Model 25 Rotary Pellet Presses, 21 and 25 punch—with motor and vari-drive.
- 2 Stokes Rotary Pellet Presses, 16 punch—B-3, D-3, D-4.
- 1 Byron Jackson Deep Well Pump, 150 GPM—335' head, NEW.
- 1 Ingersoll Rand Bronze Centrifugal Pump 23ALV, 40 HP motor, 650 GPM at 140'—NEW.
- 2 Ingersoll Rand Bronze Centrifugal Pumps, 231V-RVH, 20 HP motor, 200 GPM at 230'.

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- 202 Jacket—Vertical Agitators
 - 3—2700 gal. cap. 7'6" dia. x 7'6" high.
 - 2—950 gal. cap. 63" dia. x 78" high.
- Type 347 stainless steel shell; cast iron top.

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- 2 Stainless Steel, type 316, closed tanks—300 gal.
- 30 Stainless Steel, type 304, open top tanks—5, 15, 30, 50, 80, 100, 150, 200, 300, 500 gal. sizes.
- 1 Stainless Steel, type 347 Autoclave or pressure tank; 2502 pr. Elec. heated 450° F; 100 gal. cap., 17 1/4" dia. x 9' high.
- 3 Aluminum Tanks, 745 to 1485 gal.
- 3 Monel Tanks, 68 gal. bolted top, coils.
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- 1 Glass Lined Kettle, jkt'd. & Agit. 80 gal.
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- 1 Steel Autoclave, 90 gal., 23" dia. x 30" deep, 3002 int. pr. 1002 jkt. pr., agitated.

1 FEIMC Rotary Vacuum Filter, string discharge, 4'6" dia x 6' face, aluminum

- 2 Suspended 48" dia. Basket centrifugals, Bird & Troy.
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- 1 Steel Vacuum Kettle, 300 gal. agitator, 502 oil jkt.
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- 1 Copper Vacuum Evaporating Pan, 6' dia.—jacketed and coils.
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- 2 Worthington 6 1/2 x 6 Vacuum Pumps.
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- 2 Copper Bubble Cap Columns, 18" dia. to 48" dia.
- 2 Aluminum Columns, Bubble cap, etc.—24", 27" & 30" dia.
- 1 Steel Bubble Cap Column, 62 plates, 30" dia.
- 2 Copper Extraction Still—46 GPH & 70 GPH.
- 3 Water Still, 50 GPH & 250 GPH.

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1—23" ID x 10' H (approx. 230 gal.)
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- 2—Bufflovak Double Drum Dryers 32" x 99" complete.
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- 1—3000 gal. steel, closed, agitated.
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MISCELLANEOUS

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- 1—Stainless Steel Hydrogenator, 360 gal. cap. 250 lbs. PSI.
- 1—Niagara Stainless Steel Filter, 146 sq. ft.
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- 1—Jacketed Vacuum Autoclave, 600 gal. cap. with Agitator.
- 1—Blaw-Knox Jacketed Autoclave 3' x 42" with Agitator.
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- 1—Gemco Copper Conical Blender, 3½ cu. ft.
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- 1—Bullvac Vacuum Shelf Dryer, 7 Shelves.
- 2—Black & Clawson Double Drum Dryers, 28" x 5'.
- 2—Louisville Rotary Steam Tube Dryers, 8' x 30'.
- 2—Bullvac Vacuum Drum Dryers, 24" x 30'.
- 2—Bullvac Vacuum Drum Dryers, 3'10" x 18'.
- 3—Louisville Rotary Steam Tube Dryers, 6' x 25'.
- 1—Bullvac Double Drum Dryer, 32" x 30'.
- 1—Bullvac Double Drum Dryer, 24" x 34'.
- 1—Fitzpatrick Stainless Steel & Bronze Model D Comminuting Machine.
- 3—Bullvac Flakers 5' x 12'.
- 1—Ruggles Cole Direct Fired Kila 7½' x 60'.
- 1—Royal 21 Perforated Extruder, with heating unit.
- 1—American Locomotive Stainless Steel Heat Exchanger, Model Twin Double Pipe, Size 3½ x 27 x 24.

- 4—Steel Heat Exchangers, 800 sq. ft. each.
- 1—Sperry 36" x 36" Recessed Type Filter, centre-feed, open-delivery, 42 Hercules covered Plates.
- 2—Valles Filters, #7E, 2B & 3.
- 10—Alsup Bronze & Brass Filters, Model #PAK 12-4.
- 1—Sperry Aluminum Filter Press, 18" x 18", 9 Chambers.
- 1—Sperry 42" x 42" Wooden Plate & Frame Filter Press, Closed Delivery, 54 Chambers with hydraulic closing device.
- 1—Shriver Cast Iron Jacketed Plate & Frame Filter Press, 36" x 48", 48 Chambers.

- 1—Stainless Steel Jacketed Vacuum Kettle with agitator, 250 gal. cap.
- 1—Stainless Steel High Pressure Kettle, 360 gal. cap.
- 2—Patterson Jacketed Vacuum Autoclaves, 4' x 10' with Drives and Motors.
- 1—Stainless Steel Jacketed Reactor, 550 gal. cap. with Stainless Steel Condenser & Stainless Steel Packed Column.

- 1—Sperry Aluminum Filter Press, 24" x 24", 22 Chambers.
- 1—Artesian Metal Works Steel Jacketed Kettle, 1000 gal. cap. with agitator.
- 2—Bullvac Cast Iron Jacketed Kettles, 1200 gal. cap. each.
- 1—Eppenbach Stainless Steel Colloid Mill, Model QV-7.
- 1—Hess 30 gal. cap. Change Can Mixer.
- 13—Statelco Steel Storage Tanks 500 gal. cap. Unused.
- 1—Mikro Atomizer Stainless Steel construction.
- 1—Flaudler Glass-lined Evaporating Dish.
- 1—Shriver Cast Iron Filter Press, 36" x 36", Closed Delivery, 25 & 28 Chambers.
- 1—Sperry Cast Iron 30" x 30" Filter Press, Recessed Type, 35 Chambers, Open Delivery.
- 1—Sperry Tin Plated 18" x 18" Plate & Frame Filter Press, Closed Delivery, 20 Chambers.
- 1—Copper Jacketed Kettle, 6' x 8' with agitator.
- 6—Cast Iron Jacketed Kettles, 210 to 600 gal. cap.
- 1—J. P. Devine Vacuum, Jacketed Kettle, 2000 gal. cap.
- 9—Steel Electrically Heated Kettles, 450, 900 & 1000 gal. cap.
- 18—Flaudler Jacketed Glass-lined Kettles, 360, 400 & 1750 gal. cap.
- 1—Babury Mixer #1 with 50 Hp motor.
- 3—Baker Perkins Double Arm Mixers, 200 gal. cap., sigma blades.
- 2—J. H. Day Megal Type Mixers, 2½ & 5 gal. cap.
- 5—Simpson #20 Intensive Mixers, "Unused".
- 1—Simpson #21 Mixer.
- 1—Day Foney Mixer, 15 gal. cap.
- 1—Patterson Porcelain Lined Pebble Mill, Type D, with 25 HP motor.
- 3—Hardinge Conical Ball Mills, 8' x 30", 5' x 22" & 6' x 22".
- 1—Abbe Engineering Silex-lined Pebble Mill, 6' x 12'.
- 1—Abbe Engineering Rubstone-lined Ball Mill, 5' x 4'.
- 1—Ball Mill, Stone-lined, 7' x 5'.
- 2—Mikro Pulverizers #1 SH.
- 1—Mikro Stainless Steel Pulverizer #2 TH.
- 3—Rubber-lined Storage Tanks, 310 & 250 gal. cap.
- 5—Stainless Steel Storage Tanks, 50, 180, & 221 gal. cap.
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- 3—Steel Storage Tanks, 10,000 gal. cap.
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- 2—Orville Simpson #41, Rotex Screens.

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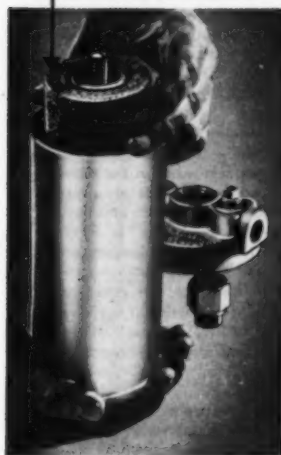
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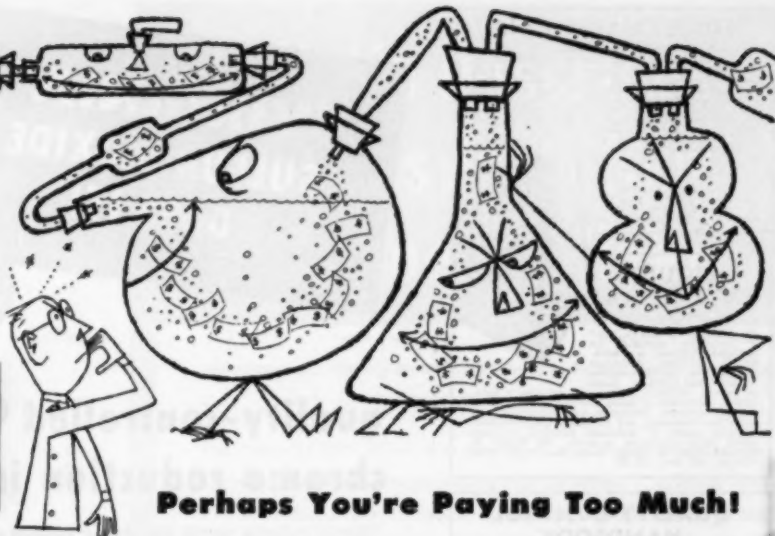
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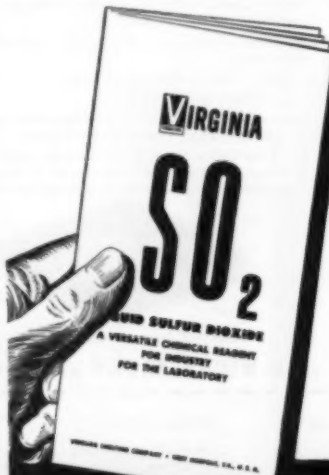
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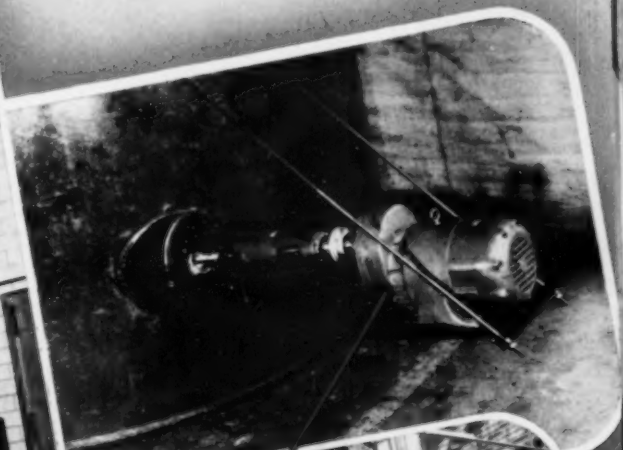
the **RIGHT** horsepower
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Gear reduction ratios up to 432 to 1



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